

From: Whittaker, Laura [laura.whittaker@aptim.com]

Sent: Thursday, November 1, 2018 6:49 AM

To: Liscio, Matthew P CIV SEA 04, NAVSEA DET RASO [matthew.liscio@navy.mil]

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Subject: [Non-DoD Source] Data package ready for review - HPNS PE-2, RSY C9 (DC)

Attachments: HPNS APTIM RSY C9 (DC) Soil Non-LLRW Concurrence Request 11012018 (reduc....pdf)

Mr. Liscio,

APTIM request RASO concurrence to designate this soil as Non-LLRW soil.

If there are any questions or if additional data is required, please contact me.

Thank you.

LAURA WHITTAKER

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Hunters Point Naval Shipyard, Parcel E-2 RSY Data Report

Contract No. EMAC III CTO-0013		
RSY Pad: C9	RSY Pad Use Number: Deconstruction (DC)	First Submittal <input checked="" type="checkbox"/> Second Submittal <input type="checkbox"/>
Data attached and submitted by: Laura Whittaker		Data Report Submittal Date: 11/01/2018

Soil Sample Data					
Sample Identification	Survey Location	Type of Sample	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	Total Sr Final Analytical Results (pCi/g)
Upper limit of site reference background			1.633	0.113	0.331
PE2-RSYC9-DC-S001	1	Systematic	0.637	0.0101	0.0631
PE2-RSYC9-DC-S002	2	Systematic	0.613	0.0289	N/A
PE2-RSYC9-DC-S003	3	Systematic	0.923	0.036	N/A
PE2-RSYC9-DC-S004	4	Systematic	0.536	-0.0518	N/A
PE2-RSYC9-DC-S005	5	Systematic	0.517	0.0372	N/A
PE2-RSYC9-DC-S006	6	Systematic	0.711	-0.0399	N/A
PE2-RSYC9-DC-S007	7	Systematic	0.699	0.00168	N/A
PE2-RSYC9-DC-S008	8	Systematic	0.607	0.00232	N/A
PE2-RSYC9-DC-S009	9	Systematic	0.708	-0.0123	N/A
PE2-RSYC9-DC-S010	10	Systematic	0.559	-0.0697	N/A
PE2-RSYC9-DC-S011	11	Systematic	0.560	0.0239	0.0103
PE2-RSYC9-DC-S012	12	Systematic	0.752	0.0264	N/A
PE2-RSYC9-DC-S013	13	Systematic	0.629	-0.00141	N/A
PE2-RSYC9-DC-S014	14	Systematic	0.343	0.0319	N/A
PE2-RSYC9-DC-S015	15	Systematic	0.585	-0.0353	N/A
PE2-RSYC9-DC-S016	16	Systematic	0.954	-0.0217	N/A
PE2-RSYC9-DC-S017	17	Systematic	0.577	-0.0423	N/A
PE2-RSYC9-DC-S018	18	Systematic	0.219	-0.0833	N/A
Biased Soil Sample Data					
PE2-RSYC9-DC-B-S001	1	Biased	0.840	-0.0514	0.0341
PE2-RSYC9-DC-B-S002	2	Biased	0.555	-0.0398	N/A
PE2-RSYC9-DC-B-S003	3	Biased	0.612	0.0314	N/A
PE2-RSYC9-DC-B-S004	4	Biased	0.641	0.0255	N/A
PE2-RSYC9-DC-B-S005	5	Biased	0.553	-0.0290	N/A
PE2-RSYC9-DC-B-S006	6	Biased	0.564	0.00238	N/A

²²⁶Ra Radium-226
¹³⁷Cs Cesium-137
 Sr Strontium
 pCi/g Picocuries per gram

Instrument and Survey Data										
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #	Reference Area Static Bkgd	Reference Area Static 3σ IL	Reference Area Scan Bkgd	Reference Area Scan 3σ IL	Range
RSI Gamma Walkover Survey	HPRS-08292018-PE2-ROV2-2944	08/29/2018	RS-701/RSX-1	N/A	Console: 7236 Detectors: 5447,5448	N/A	N/A	3,400 CPS	4,842 CPS	3,224-4,834 CPS
RSI Follow-up Static Survey	HPRS-09042018-PE2-JSS2-2951	09/04/2018	RS-701/RSX-1	N/A	Console: 7236 Detectors: 5447,5448	3,612 CPS	4,255 CPS	N/A	N/A	3,576-4,730* CPS
Systematic Sample Survey	HPRS-09062018-PE2-JSS-2960	09/06/2018	2221	06/29/2019	117634	15,069 CPM	17,241 CPM	N/A	N/A	14,409-19,431* CPM
Biased Sample Survey	HPRS-09202018-PE2-JSS-2984	09/20/2018	2221	02/09/2019	105934	15,147 CPM	17,406 CPM	N/A	N/A	20,033-21,010* CPM

+ Gamma readings exceeding the Reference Area 3σ IL are attributable to the presence of naturally-occurring non-Navy program radionuclides in the excavated soil—see Note(s) in the Summary table (page 2) for more details.

3σ IL Investigation Level (established at 3σ above the mean of the Reference Area dataset)

CPS Counts per second

CPM Counts per minute

Summary
<p>1) RSI gamma walkover survey and data review—upon review of initial scan data, follow-up static investigations were deemed necessary, and investigation locations were identified as per the RSI Data Evaluation Process (pages 3-4). Gamma scan coverage is shown on the Systematic Sample Survey map (page 8). Contour maps of scan data are shown on RSI Data Plots (page 5). Data review results are summarized on RSI Review Summary (page 6).</p>
<p>2) RSI Follow-up static survey—27 locations identified during the data review process were investigated. 6 follow-up locations exceeded the Reference Area static IL for regions of interests (ROIs) 6, 7, and/or 8 (VD1). Follow-up locations are shown on the RSI Follow-up Static Survey map (page 7).</p> <p>Note: Gamma readings reported in the Instrument and Survey Data table (page 1) for the gamma walkover and follow-up static surveys show the mean gamma gross count rate range (ROI 10, VD1) for all surveyed follow-up locations. Spectral analysis result of follow-up locations 3, 11, 15, 19, 20, and 24 exceeded the Reference Area Static IL for regions of interests (ROI) 6, 7, and/or 8. Count rates in all radionuclide-specific ROIs (3, 6, 7 and 8) were less than the radionuclide-specific Reference Area static ILs for all other follow-up investigation locations.</p> <p>Biased soil samples PE2-RSYC9-DC-B-S001-PE2-RSYC9-DC-B-S006 were collected and submitted for gamma spectroscopy analysis to further characterize the elevated soil readings at follow-up locations 3, 8, 14, 22, 28, 31, and 32 (see Summary Note 4 below).</p>
<p>3) Eighteen systematic soil samples (001-018) were obtained and submitted for gamma spectroscopy analysis. Sample locations for systematic samples are shown on the Systematic Sample Survey map (page 8). TestAmerica sample results are attached (pages 39-62).</p> <p>Ten percent of the systematic soil samples (three samples in total, PE2-RSYC9-DC-S001, PE2-RSYC9-DC-S011 & PE2-RSYC9-DC-B-S001) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 39-62 & 63-79).</p>
<p>4) Biased sample survey—samples PE2-RSYC9-DC-B-S001-PE2-RSYC9-DC-B-S006 were obtained and analyzed to support the evaluation of elevated gamma readings collected at follow-up locations 3, 11, 15, 19, 20, and 24. Biased soil sample location are shown on the Biased Sample Survey map (page 9). TestAmerica sample results are attached (pages 63-79).</p> <p>Note: Static gamma measurements collected at systematic and biased sample locations were obtained with a handheld Ludlum 2221 Scaler/Ratemeter and 3"x3" NaI probe; the results show gamma readings exceeding the instrument-specific Reference Area Static IL at several sample locations. Sample results indicate that this activity is due to the presence of naturally-occurring non-Navy program radionuclides in the excavated soil.</p>
<p>Conclusions:</p> <p>All locations with elevated Z-scores identified by the RSI gamma walkover survey were determined to be consistent with background. 27 locations were investigated during the follow-up static survey, with six readings greater than the Reference Area static IL at follow-up locations 3, 11, 15, 19, 20, and 24 for ROIs 6, 7 and/or 8 (VD1). Spectral analysis results and gamma static data for each region of interest (ROI) are provided (pages 10-36).</p> <p>Final analytical results for systematic and biased samples from this RSY pad are concluded to be comparable to background. Histograms showing systematic soil sample activity concentrations are provided (pages 37-38). Ten percent of the systematic and biased soil samples (three samples in total, PE2-RSYC9-DC-S001, PE2-RSYC9-DC-S011 & PE2-RSYC9-DC-B-S001) were also analyzed for total strontium, with concentrations less than the Project Action Limit of 0.331 pCi/g, as shown in the Soil Sample Data table (page 1).</p> <p>This data package characterizes the construction base layer for RSY C9 pad. The soil was initially import clean material.</p> <p>APTIM request RASO concurrence to release this soil as Non-LLRW.</p> <p>Disposition: This soil shall be dispositioned as non-LLRW waste. The soil will be stockpiled onsite for reuse following appropriate chemical characterization.</p>

RSI Data Evaluation Process

RS-700 Mobile Radiation Monitoring System

- Self-contained gamma-ray radiation detection and monitoring system
- (2) RSX-1 4-liter NaI(Tl) gamma detectors oriented perpendicular to the direction of travel (VD1 denotes both detectors summed; VD3 refers to the left detector; and VD4 refers to the right detector)
- Multi-Channel Analyzer, allowing for monitoring of energy-specific regions of interest (ROIs)
- RadAssist survey software for control, monitoring, and recording

Ten ROIs have been established for radium and progeny, cesium, and cobalt, as well as other naturally-occurring or anthropogenic gamma-emitting radionuclides that may be of interest:

ROI	Description	Energy Range (keV)	Primary Peak (keV)
1	Total counts	411 – 2811	N/A
2	Potassium	1371 – 1569	1460
3	U/Ra-226	1659 – 1860	1764 (Bi-214)
4	Thorium	2409 – 2811	2614 (Tl-208)
5	Annihilation	456 – 570	511
6	Ra-226	546 – 666	609 (Bi-214)
7	Cs-137	600 - 720	662
8	Pb-214/Ra-226	327 – 399	351
9	Co-60	1085 - 1370	1173/1332
10	Gross Counts	24 – 2811	N/A

A tiered approach is used during data review to identify follow-up locations. Raw data are exported to a comma delimited format using RadAssist and imported into an Excel spreadsheet for review and analysis. The following review steps are completed to determine if additional follow-up measurements are necessary:

- **Playback Review:** The data file is replayed in RadAssist and reviewed for elevated count rates in ROIs 6, 7, 9, and 10 for virtual detector (VD) 1 (both detectors summed). The scan screen is also monitored for elevated count rates and alarms.
- **Count Rate Time Series Review:** The count rates for ROIs 6, 7, 9, and 10 for VDs 1, 3 (detector 1), and 4 (detector 2) are plotted in a time series and reviewed for additional peaks in count rate.
- **All ROIs:**
 - **Z-Scores:** The Z-Scores are calculated for each location in all ROIs for VDs 1, 3, and 4. Any location with four or more ROIs having a Z-Score greater than three ($Z > 3$) is marked for follow-up.
 - **Local Z-Scores:** Local Z-Scores are calculated using a moving average for each data point in all ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with four or more ROIs having a local $Z > 3$ is marked for follow-up.
 - **Semi-local Z-Scores:** Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with four or more ROIs having a semi-local $Z > 3$ is marked for follow-up.
- **ROIs 3, 6, 8, and 10 (radium-specific ROIs):**
 - Z-Scores: The Z-Scores are calculated for each location in the radium-specific ROIs for VDs 1, 3, and 4. Any location with three or more radium-specific ROIs having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in the radium-specific ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise

be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a semi-local $Z > 3$ is marked for follow-up.

- **ROI 7 (cesium-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 7 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 7 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 7 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **ROI 9 (cobalt-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 9 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 9 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 9 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **Z-Score Time Series Review:** The three types of Z-Scores for ROIs 6, 7, 9, and 10 for VDs 1, 3, and 4 are plotted in a time series and reviewed for additional peaks in Z-Scores.

Any location selected for follow-up or with a Z-Score > 3 in a radium-, cesium-, or cobalt-specific ROI will undergo spectral analysis to determine if it is statistically likely that there are ROC concentrations present at that location in quantities greater than background.

A background spectrum is subtracted from the local spectral data for a given location, and the resulting net spectrum is plotted. Critical levels, as defined in Section 6.7.1 of the Multi Agency Radiation Survey and Site Investigation Manual are calculated and plotted based on background levels. The critical level is the level, in counts, at which there is a statistical probability (with a predetermined confidence) of incorrectly identifying a measurement system background value as greater than background. Any response above this level is considered to be greater than background. The critical level is calculated for ROIs 6, 7, 8, and 9 according to the equation shown below:

Where:

$$L_C = 2.33\sqrt{B}$$

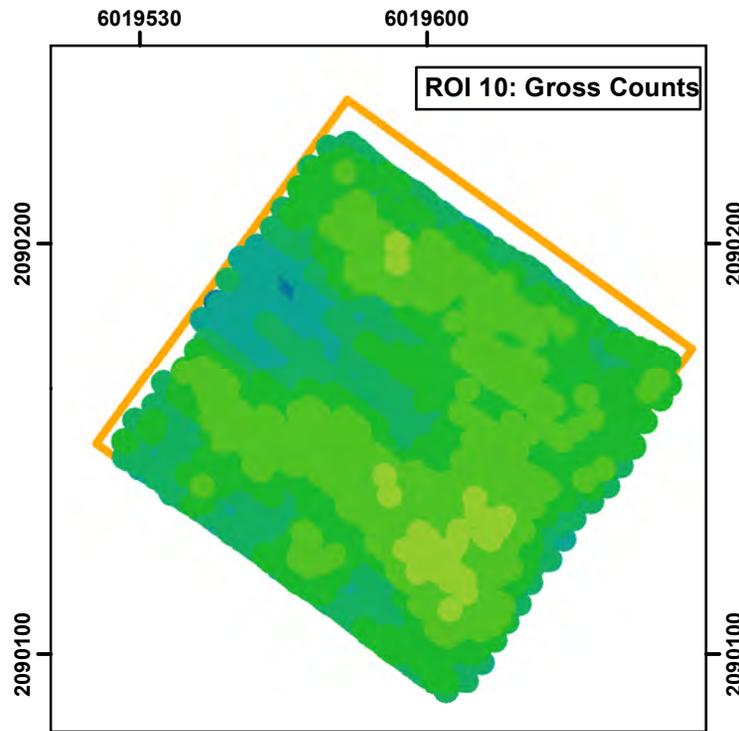
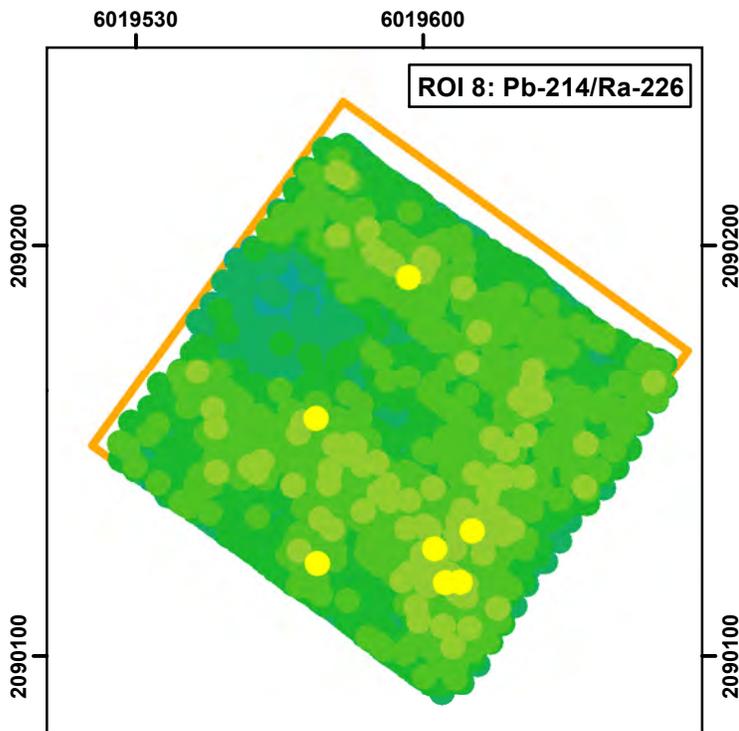
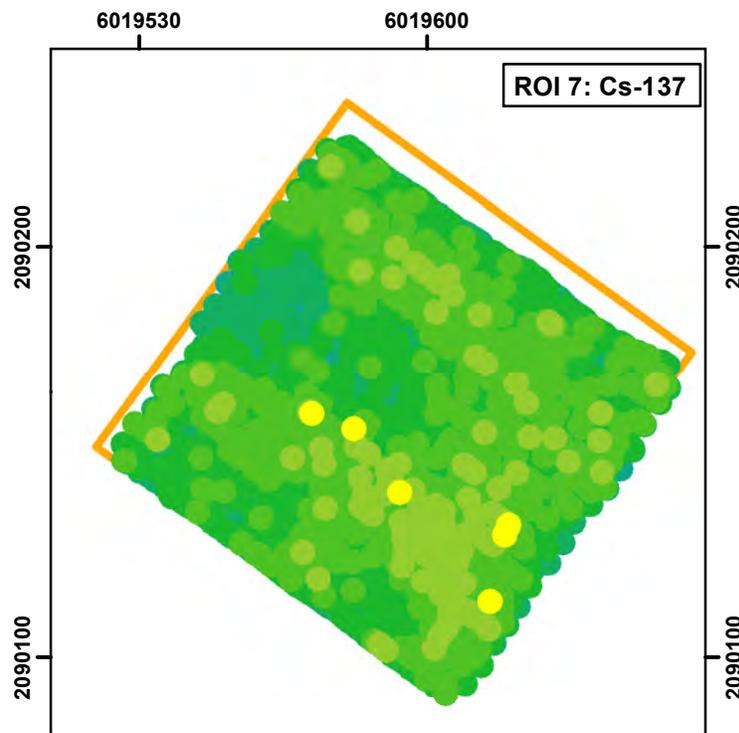
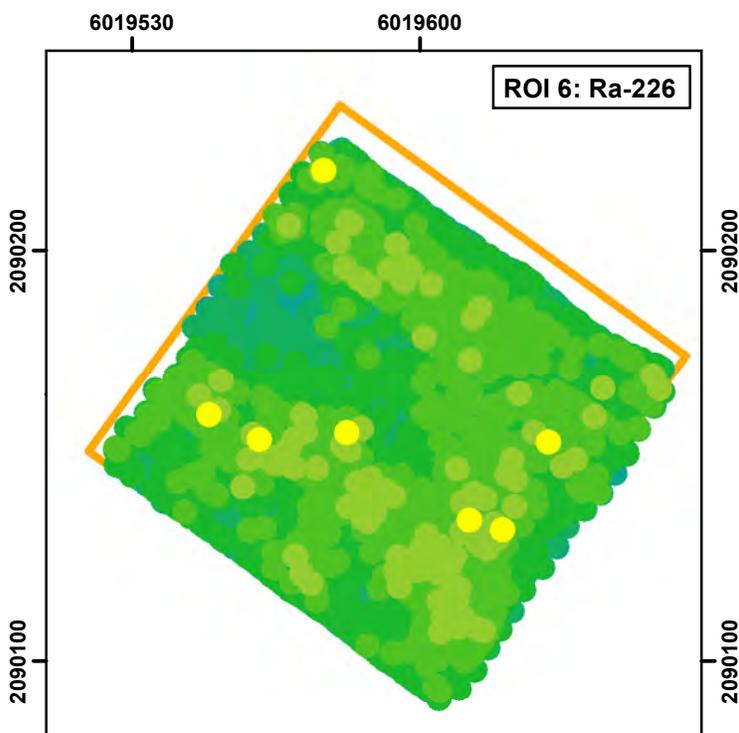
LC = critical level (counts)
 B = average background in the ROI

When count rates in the net gamma spectrum at a given location do not exceed critical levels for any radium-, cesium-, or cobalt-specific energy ranges, it is unlikely that ROC concentrations exist at that location above background.

Any data point that is both above the critical level and within the energy range of a given ROI is considered above background for that radionuclide and will be flagged for further investigation in the field.

HPNS Parcel E-2 RSY Pad C9 Deconstruction

Contour Map



RS-700 Gamma Walkover Data (VD1)

- | | |
|--|--|
| ● > 3 std dev | ● > -1 to < 0 std dev |
| ● > 2 to < 3 std dev | ● > -2 to < -1 std dev |
| ● > 1 to < 2 std dev | ● > -3 to < -2 std dev |
| ● > 0 to < 1 std dev | ● < -3 std dev |
| RSY Pad Boundaries | |



Coordinate system: CSP Zone III, NAD83, US Survey Foot



RSI Review Summary

Summary:

27 locations were initially selected for follow-up investigation. Locations were identified by elevated peaks noted in the playback review and/or time series charts, and by using the Z-Score, Local Z-Score, and Semi-Local Z-Score reviews as described in the RSI Data Evaluation Process on pages 3-4. Spectral analyses performed on 6 gamma static data locations exceeded the Reference Area Static IL for region of interest (ROIs) 6, 7, and/or 8. All other gamma static readings at follow-up locations were less than the Reference Area static IL for ROIs 3, 6, 7, and 8; figures for all locations are provided on pages 10-36.

HPNS Parcel E-2 RSY Pad C9 (DC)

6019530

6019600

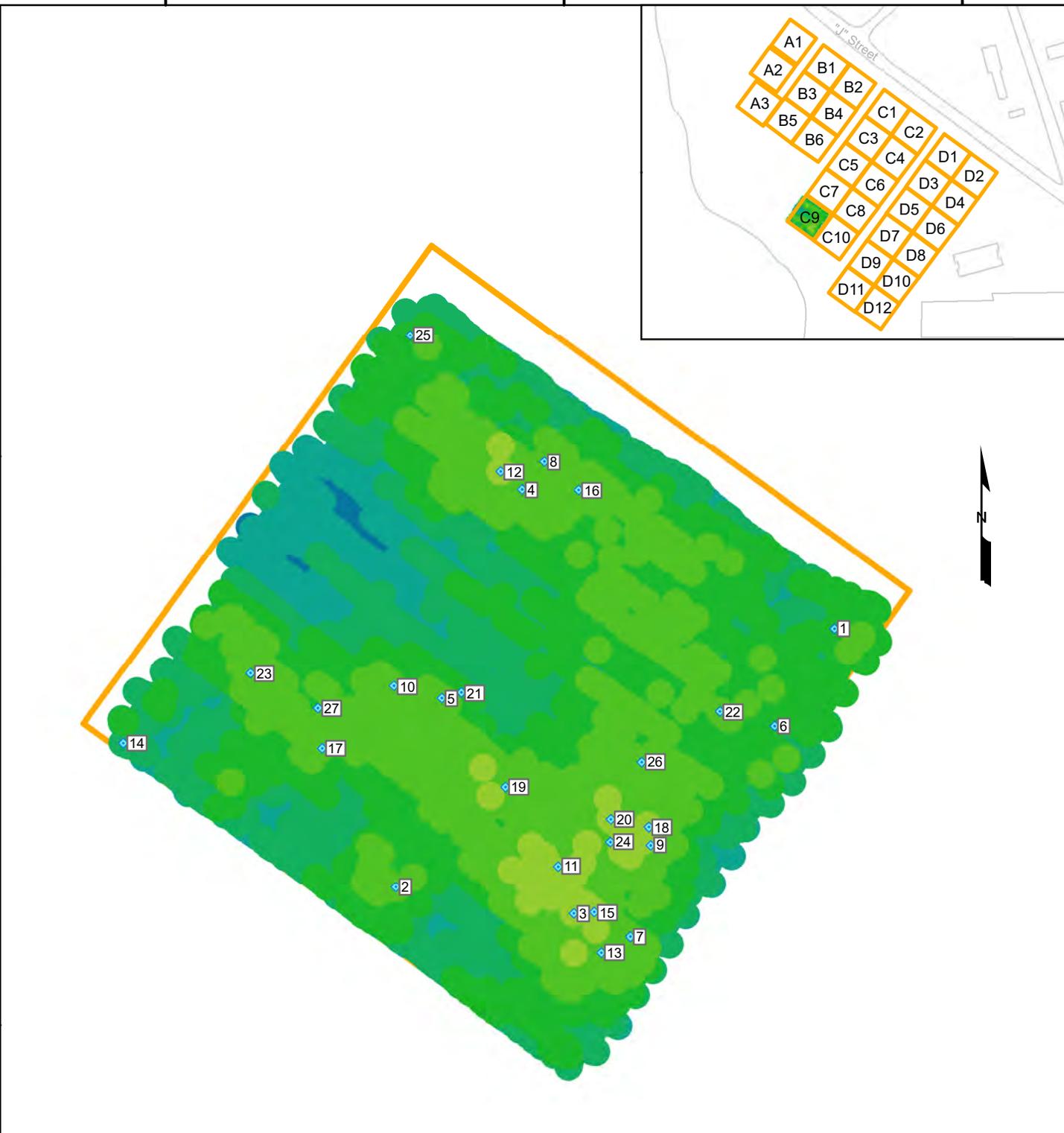
6019670

2090200

2090200

2090100

2090100



RS 700 Gamma Walkover Survey Data (VD1, ROI 10)

- ◆ Follow-up Locations
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev
- RSY Pad Boundaries

0 10 20 40
 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot



Systematic Sample Survey
HPRS-09062018-PE2-JSS-2960

HPNS Parcel E-2 RSY Pad C9-DC

6019530

6019600

6019670

2090300

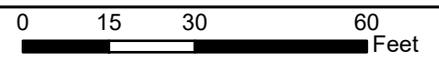
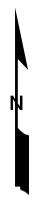
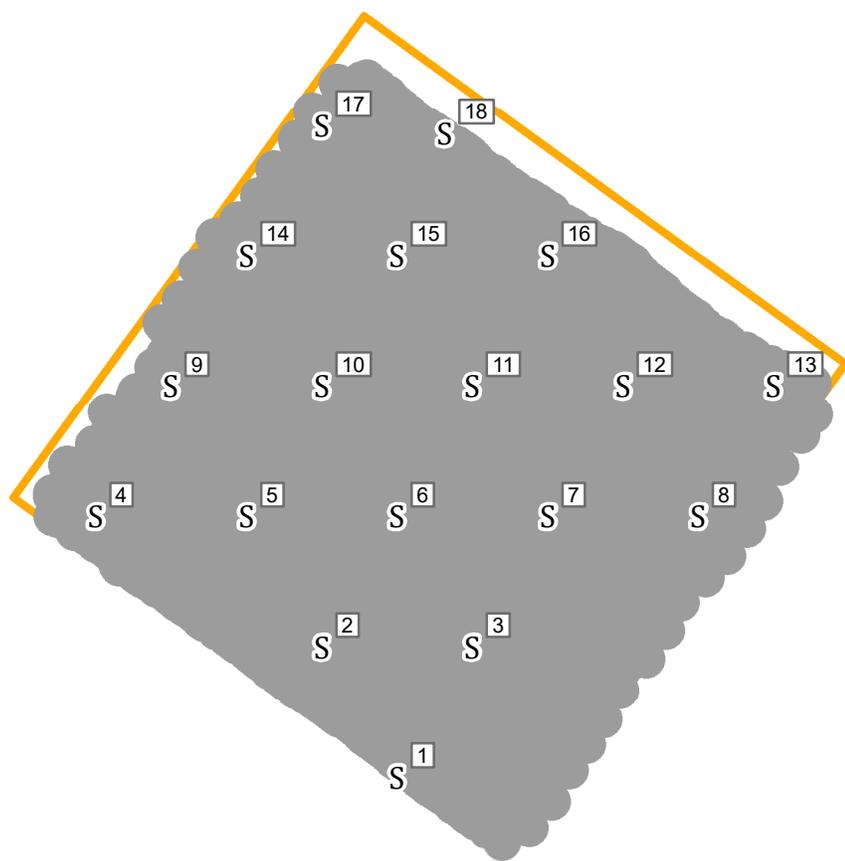
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2090200

2090200

2090100

2090100



Coordinate system: CSP Zone III. NAD83, US Survey Foot

Survey Instrument: Model 2221/ 44-20
Serial Number: 117634

- S Systematic Sample Locations
- RS-700 GWS Scan Coverage
- RSY Pad Boundaries



Biased Sample Survey
HPRS-09202018-PE2-JSS-2984

HPNS Parcel E-2 RSY Pad C9-DC

6019530

6019600

6019670

2090300

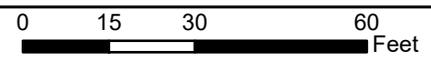
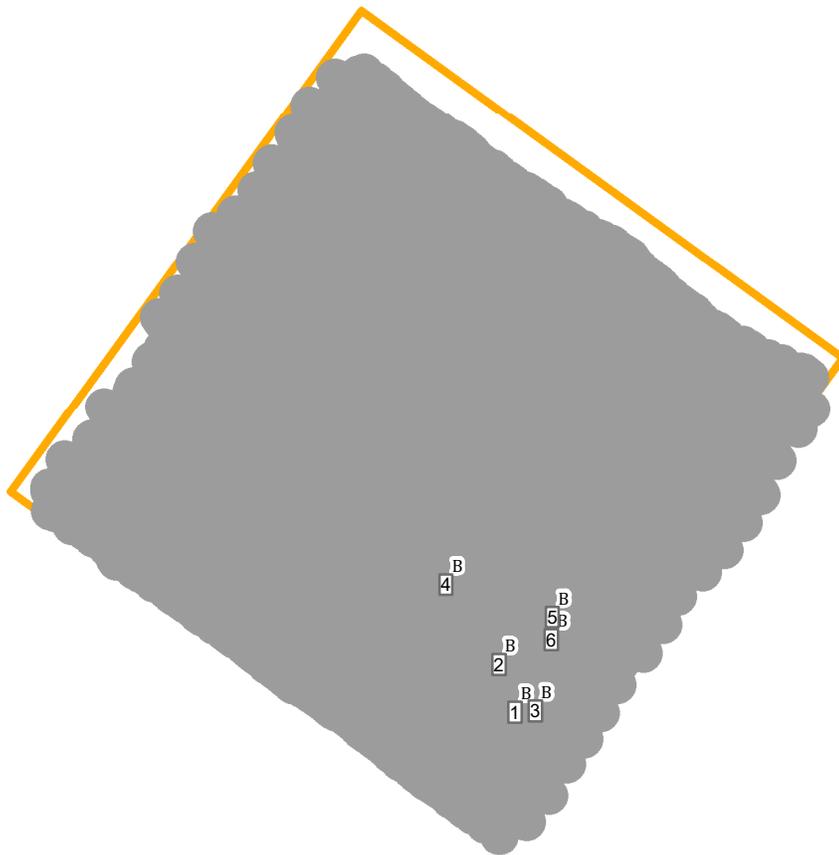
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2090200

2090100

2090100



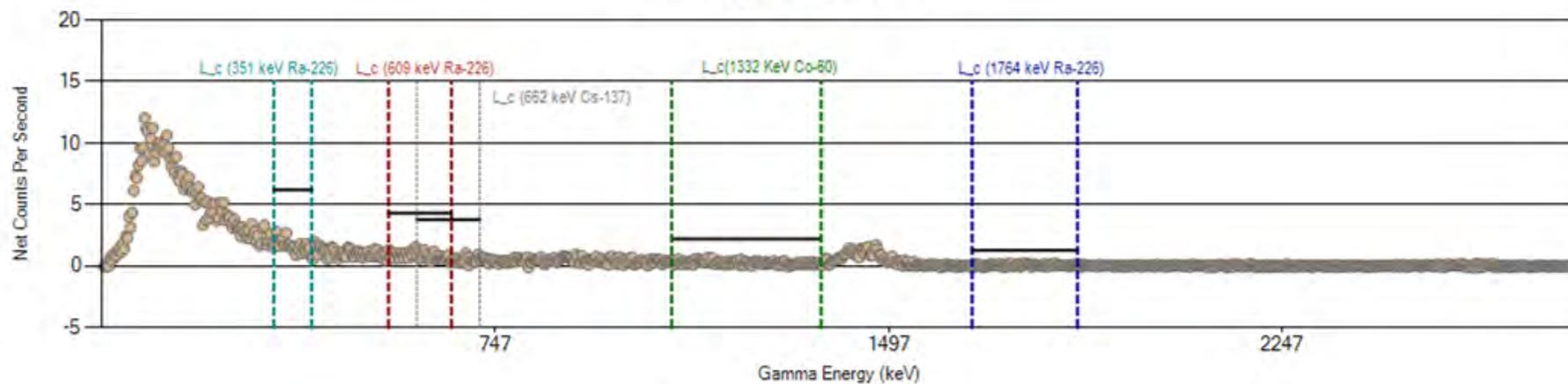
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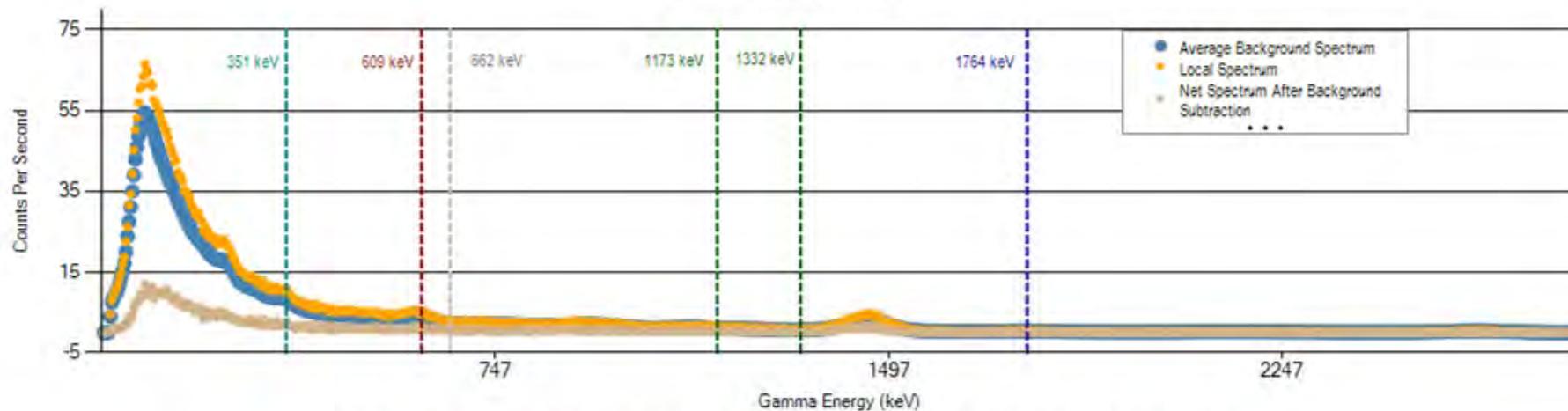
- B Biased Sample Locations
- RS-700 GWS Scan Coverage
- RSY Pad Boundaries



Net Gamma Spectrum at Location 1

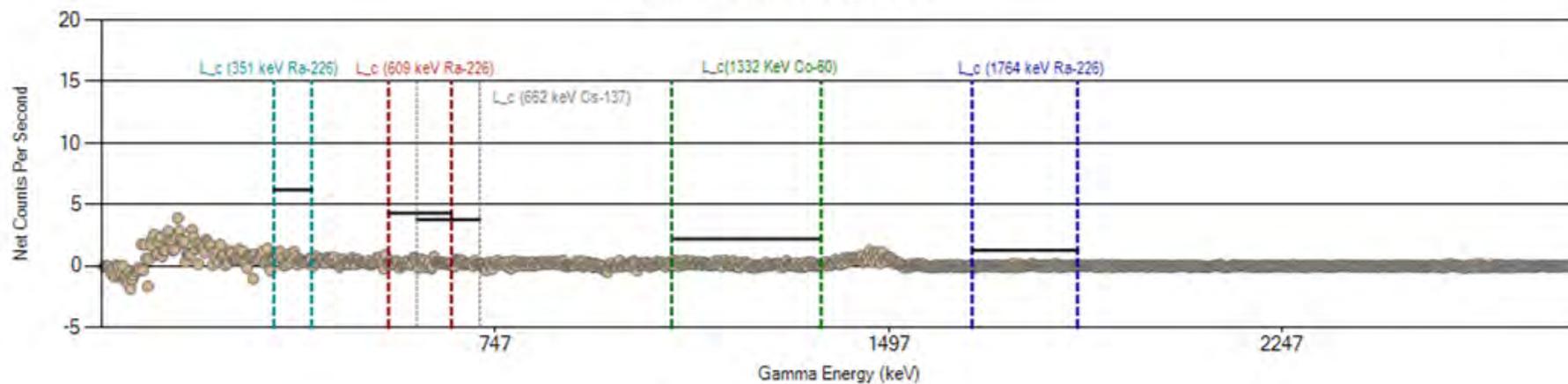


Gamma Spectra at Location 1

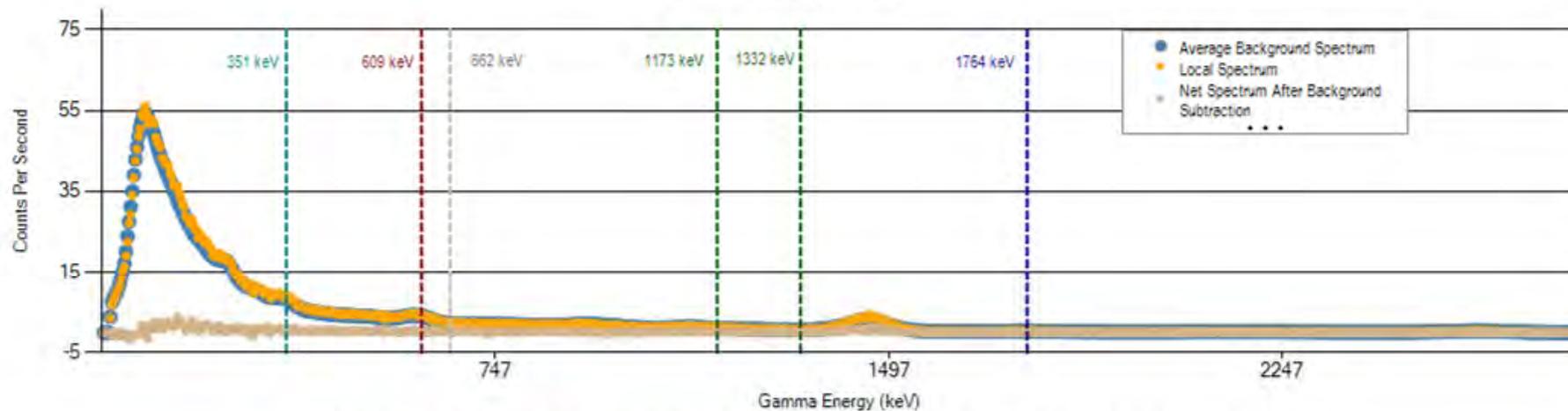


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 1 (cps)	1081	157	26	27	189	174	133	215	115	4423
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 2

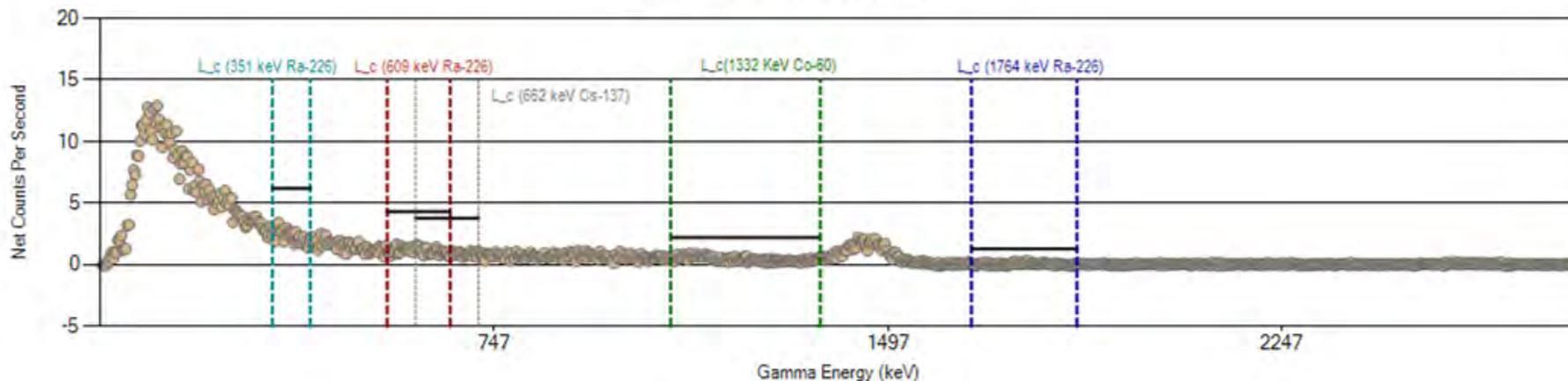


Gamma Spectra at Location 2

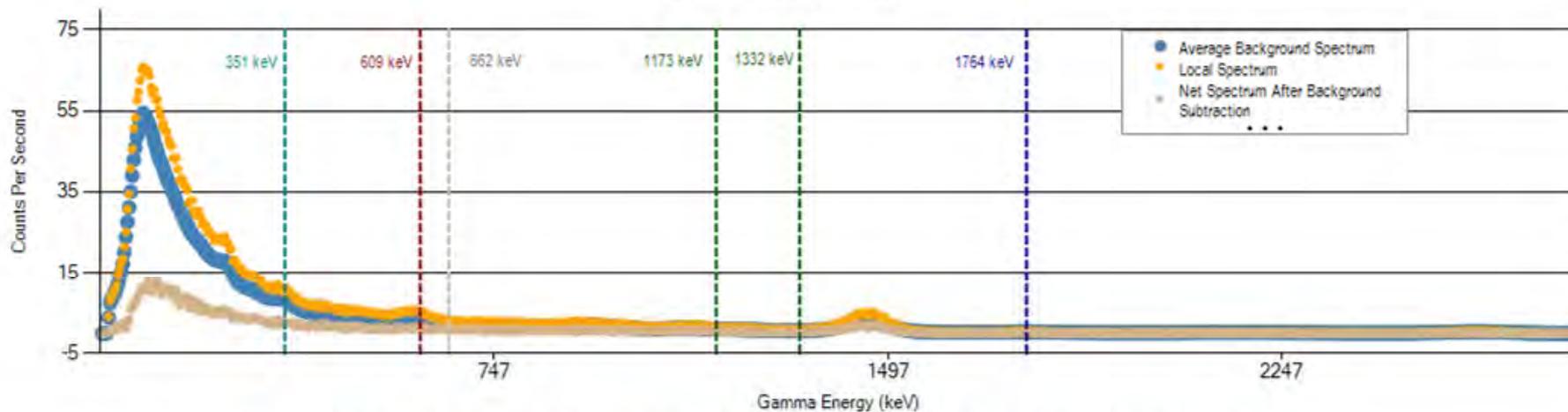


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 2 (cps)	944	140	22	24	164	150	117	188	102	3802
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 3

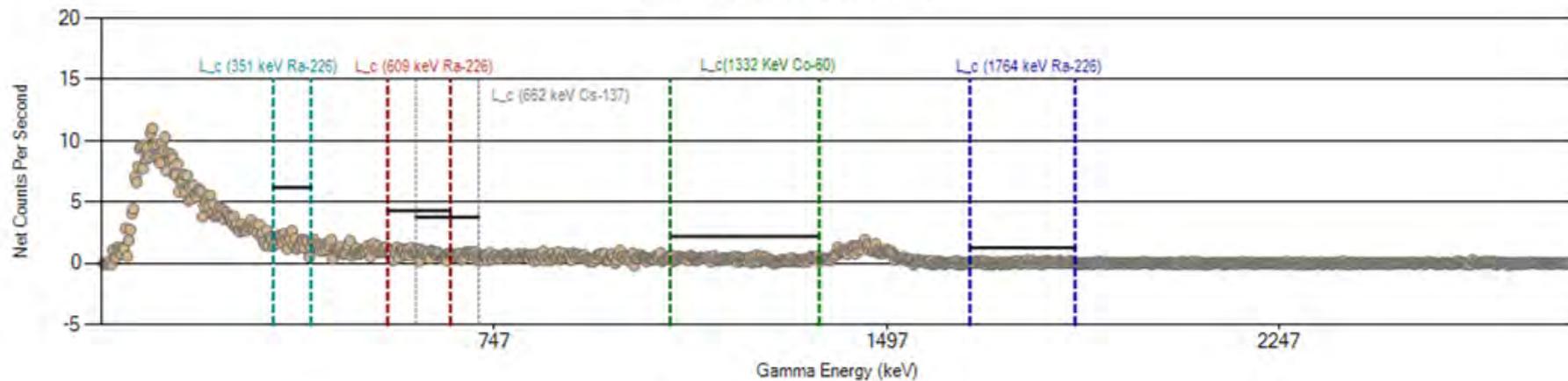


Gamma Spectra at Location 3

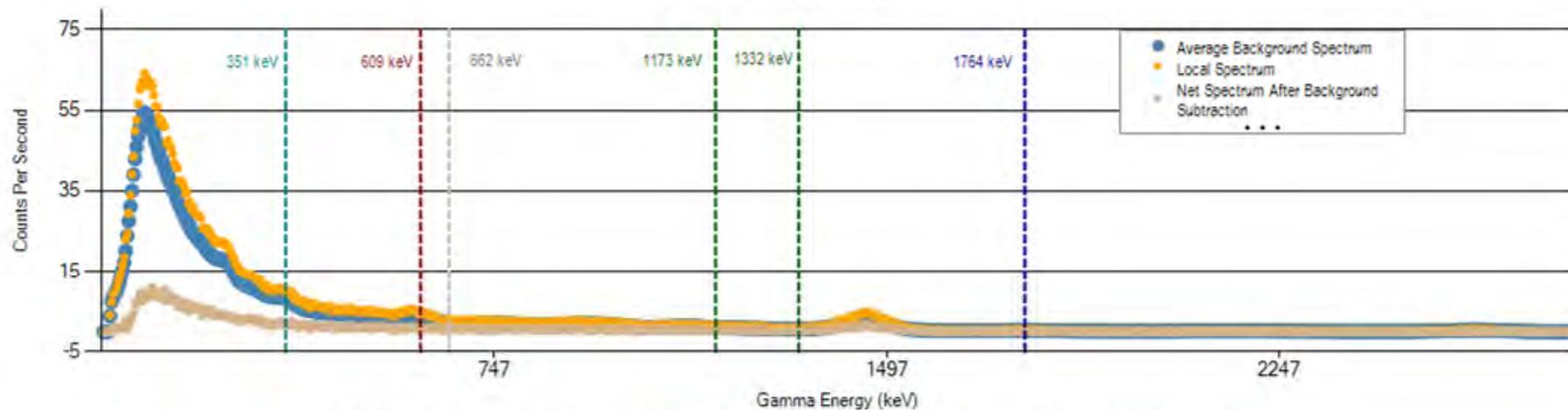


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 3 (cps)	1191	180	24	29	201	187	148	232	132	4652
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 4

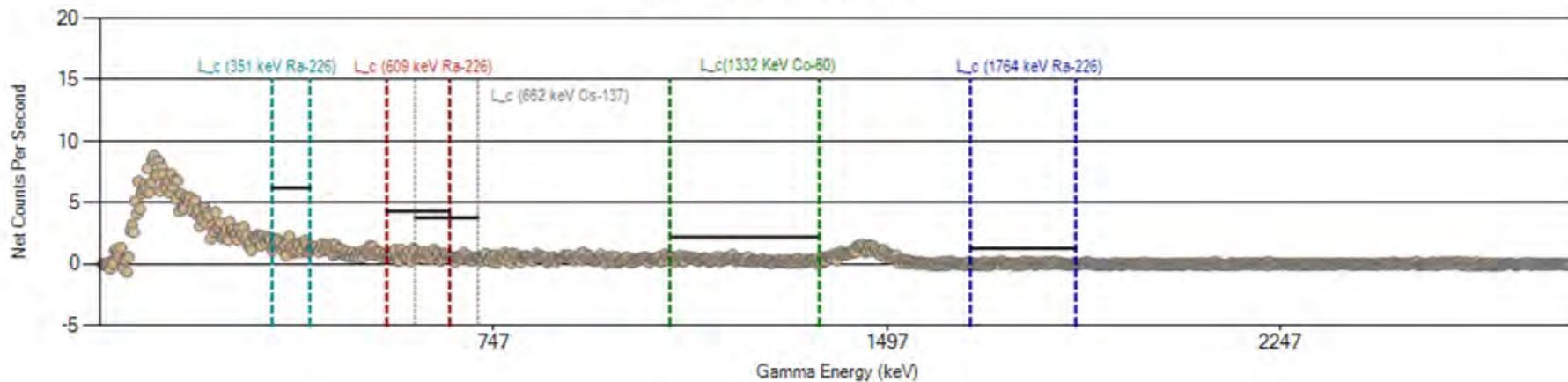


Gamma Spectra at Location 4

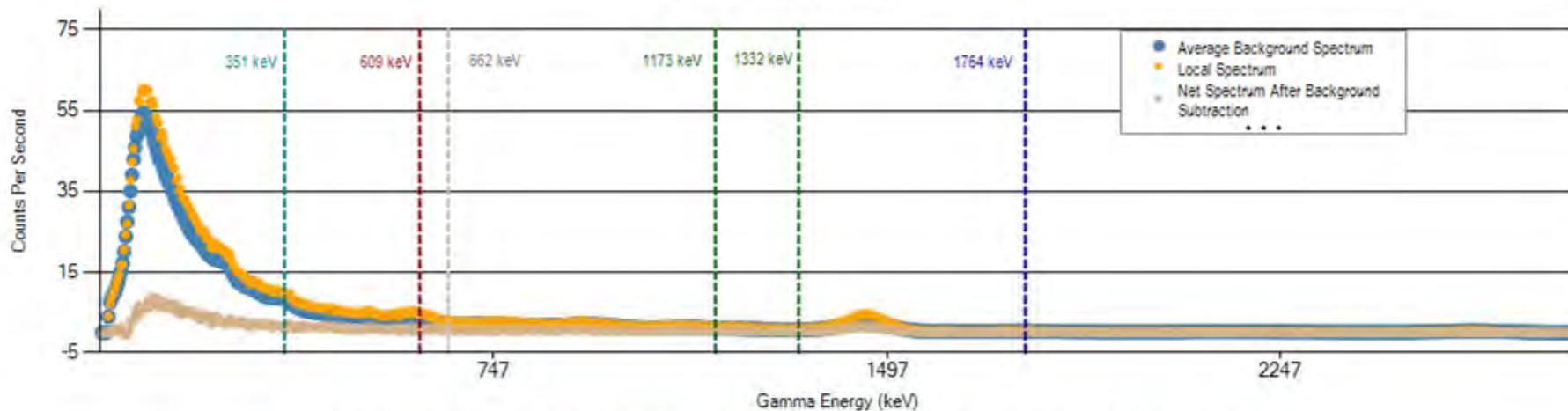


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 4 (cps)	1111	167	25	27	191	173	136	219	122	4433
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 5

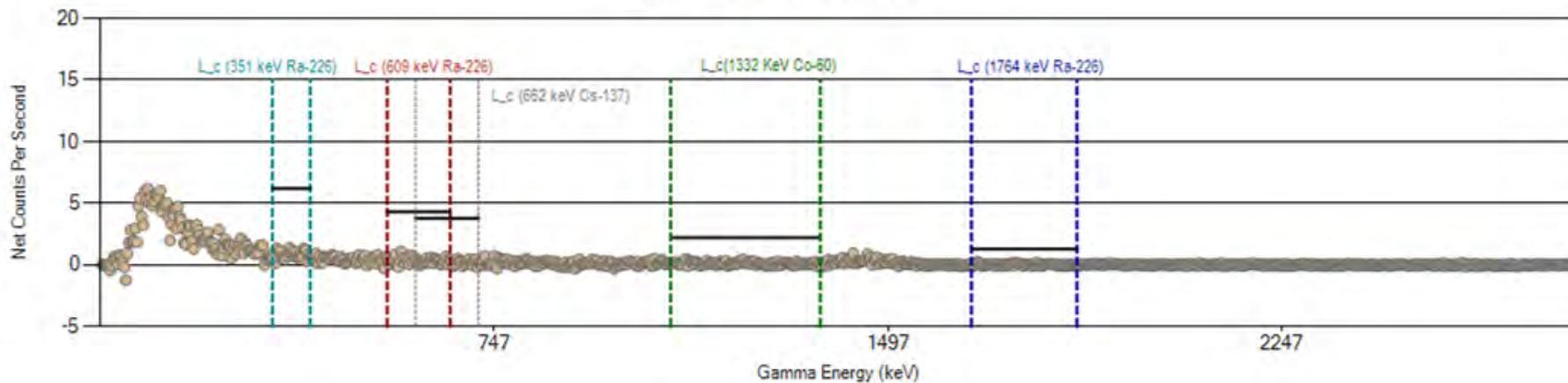


Gamma Spectra at Location 5

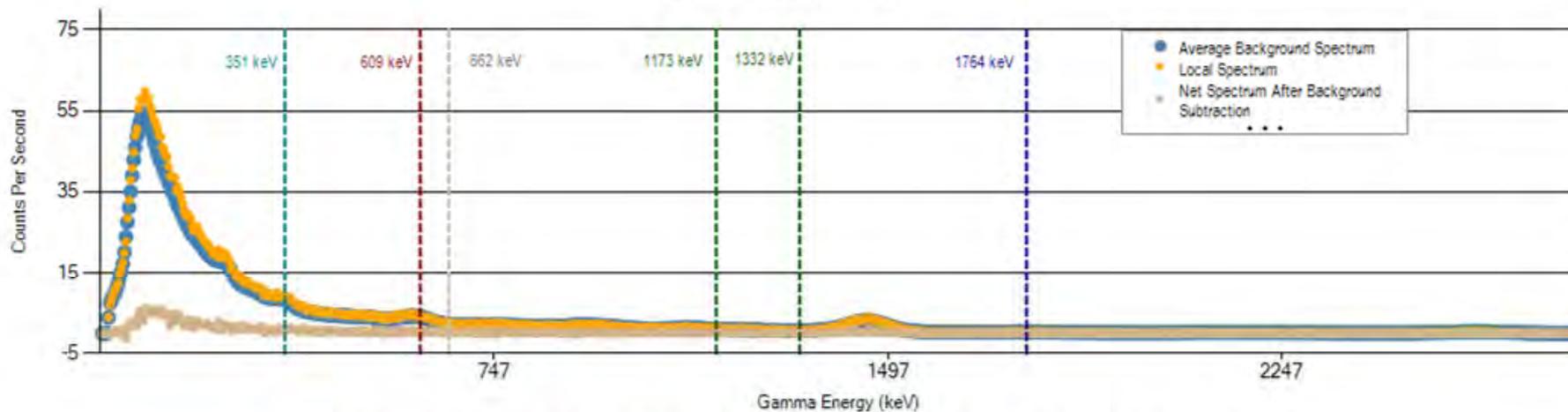


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 5 (cps)	1084	162	24	27	184	170	132	212	121	4266
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 6

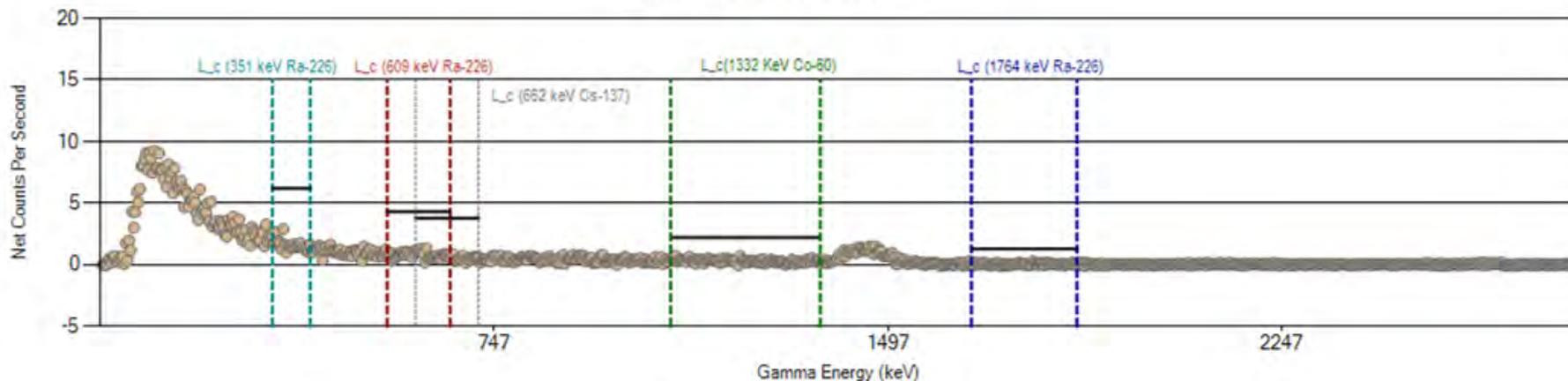


Gamma Spectra at Location 6

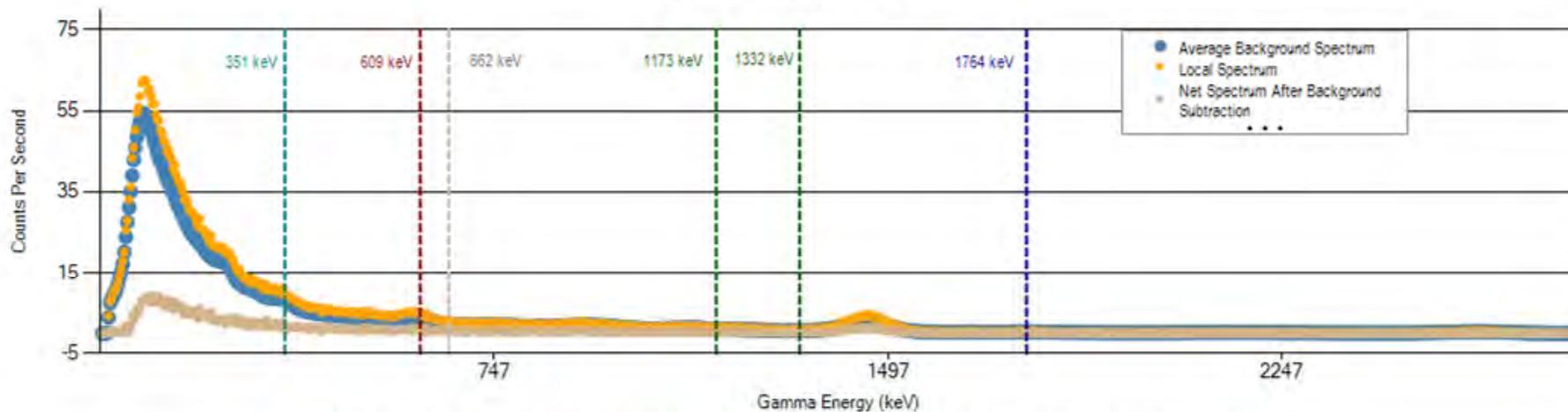


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 6 (cps)	939	131	22	24	166	154	118	195	100	3957
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 7

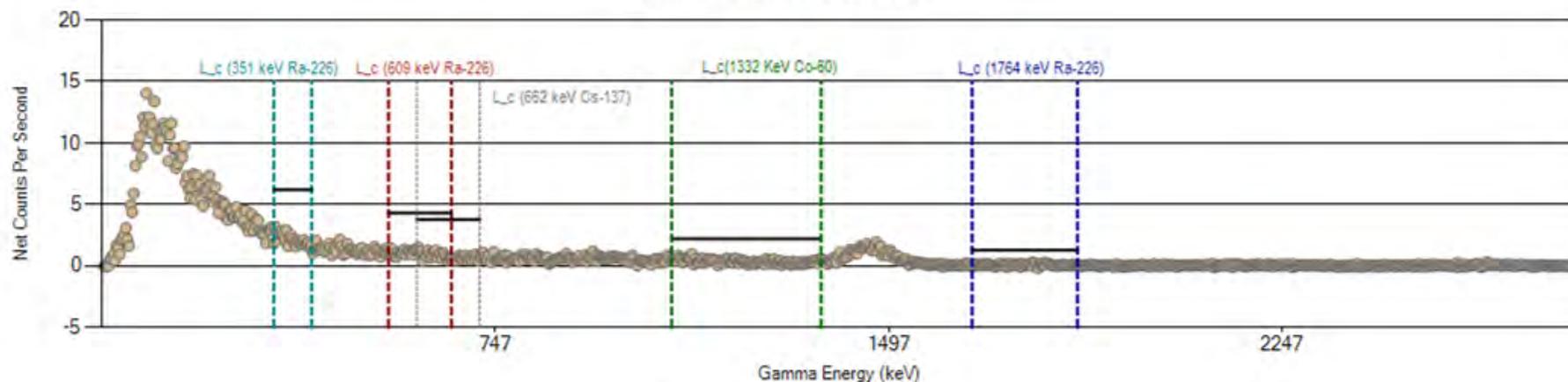


Gamma Spectra at Location 7

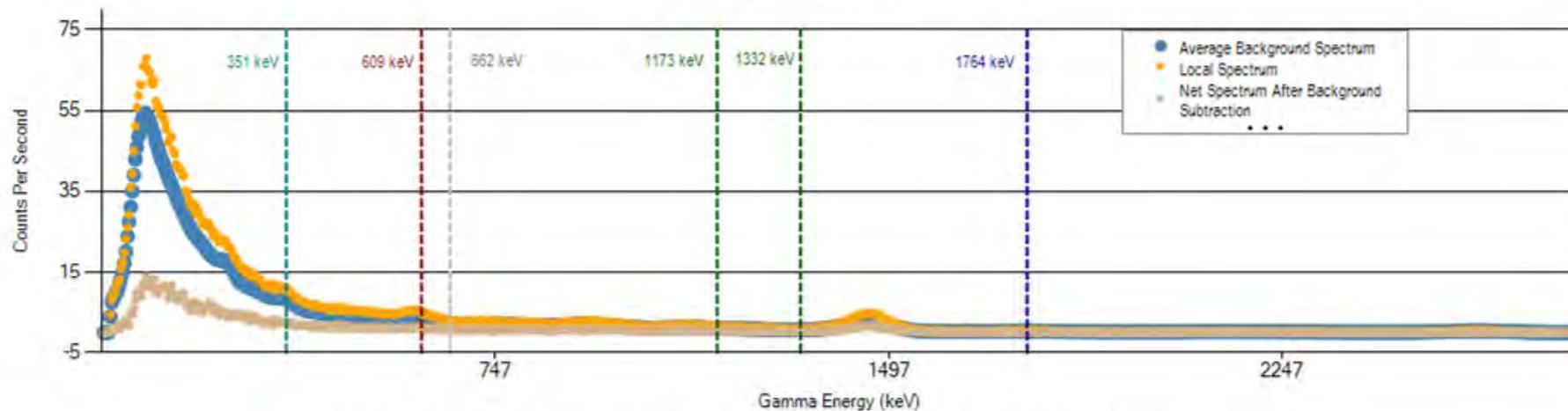


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 7 (cps)	1081	158	24	27	187	173	134	214	119	4318
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 8

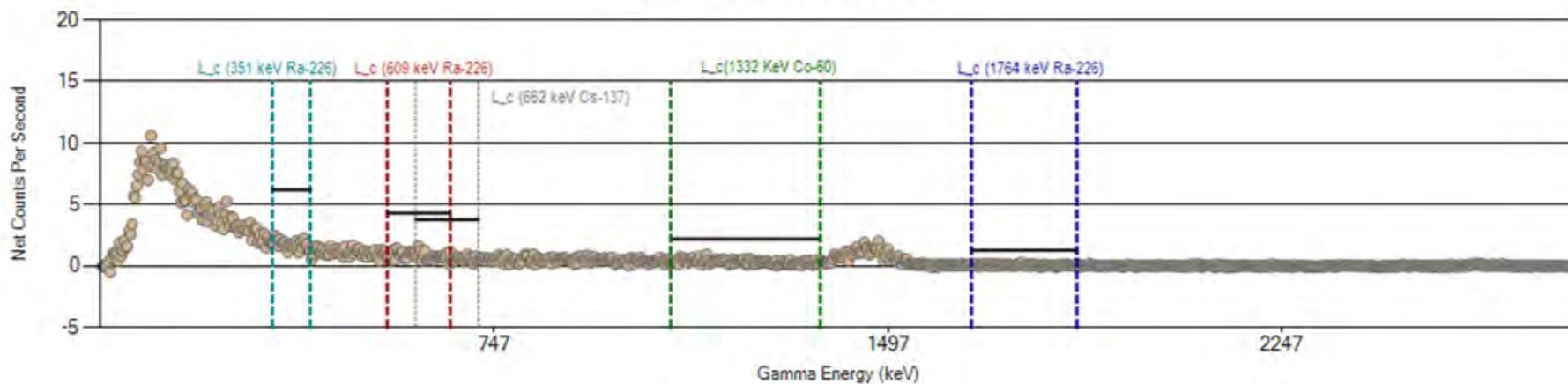


Gamma Spectra at Location 8

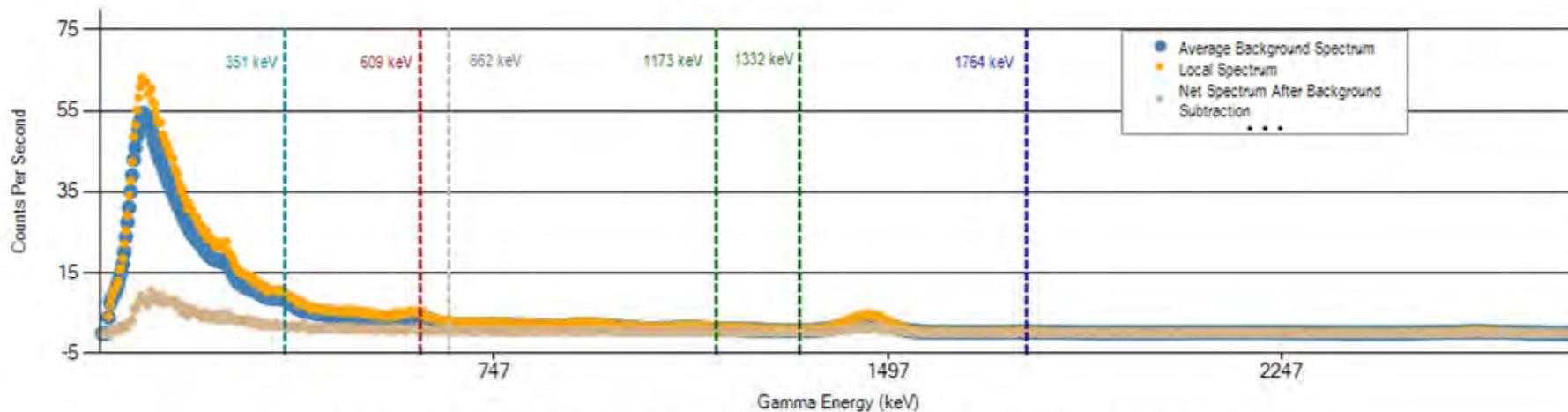


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 8 (cps)	1146	170	26	29	196	181	140	227	125	4591
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

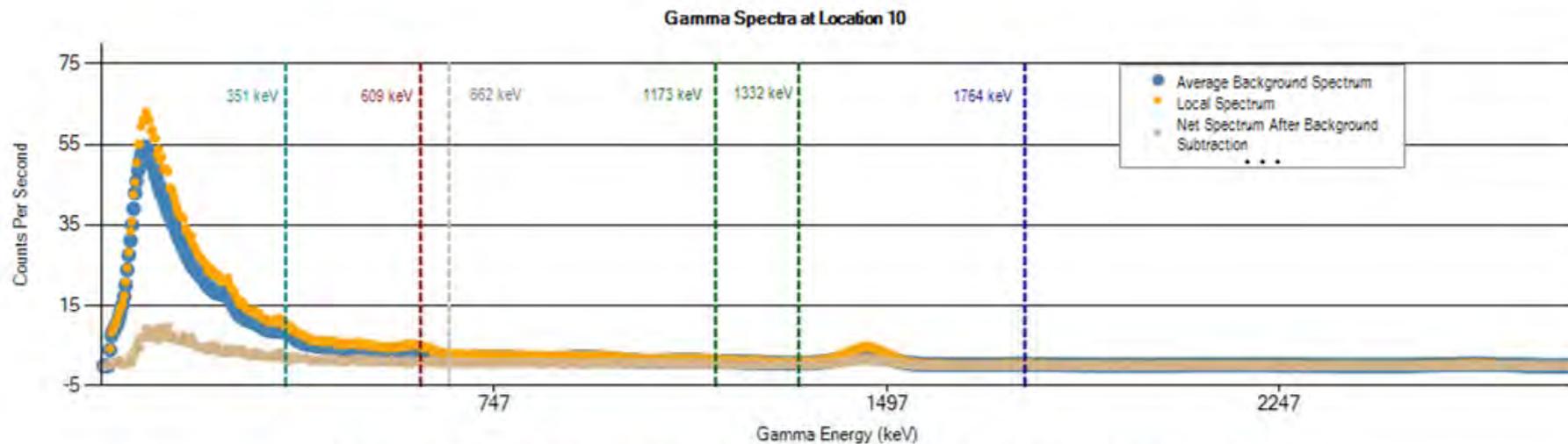
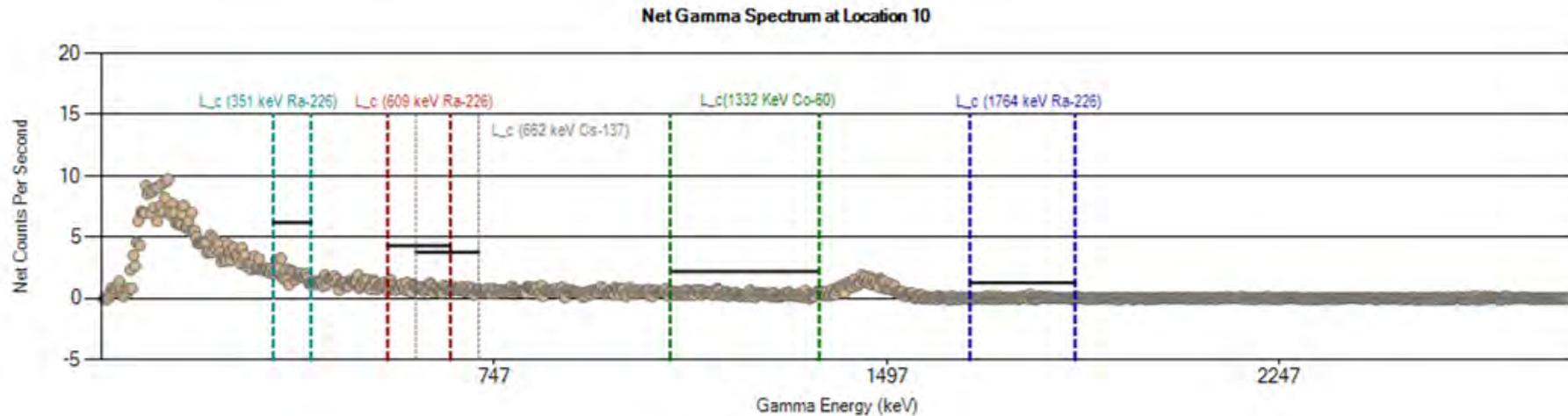
Net Gamma Spectrum at Location 9



Gamma Spectra at Location 9

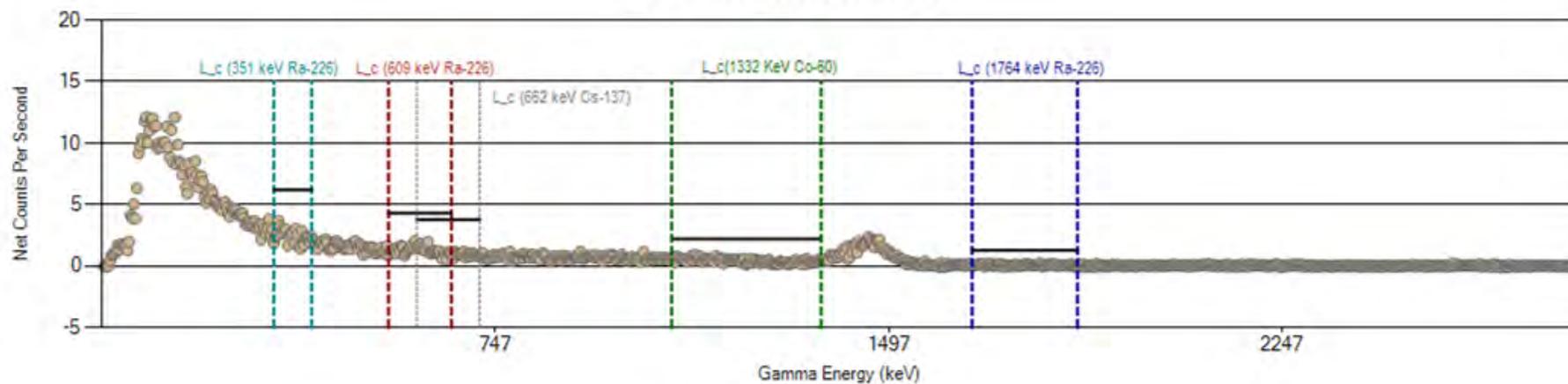


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 9 (cps)	1109	165	26	28	192	175	135	217	123	4393
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

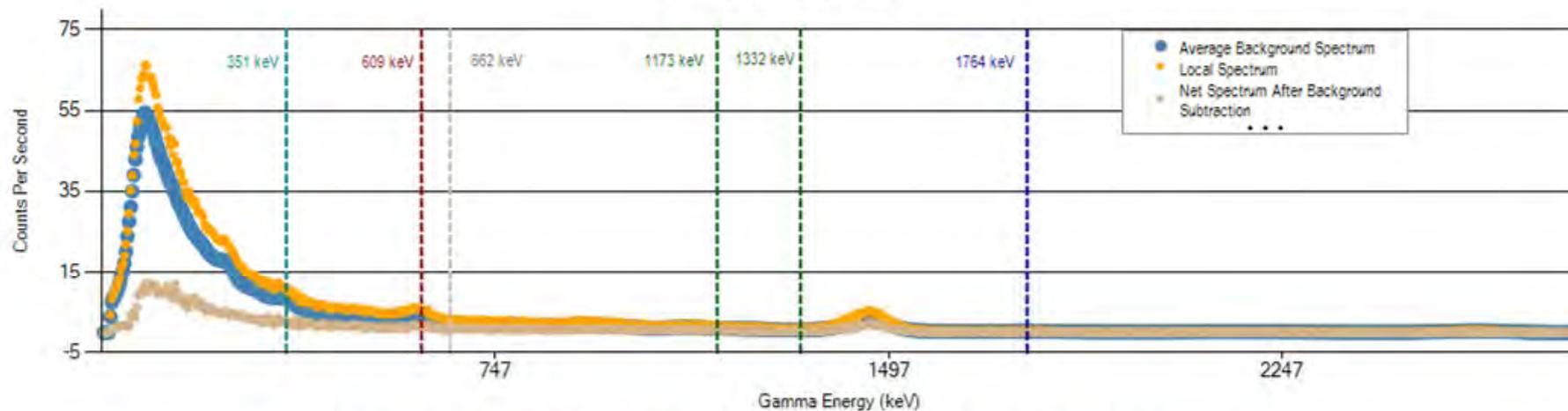


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 10 (cps)	1135	170	24	27	197	177	139	223	125	4405
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

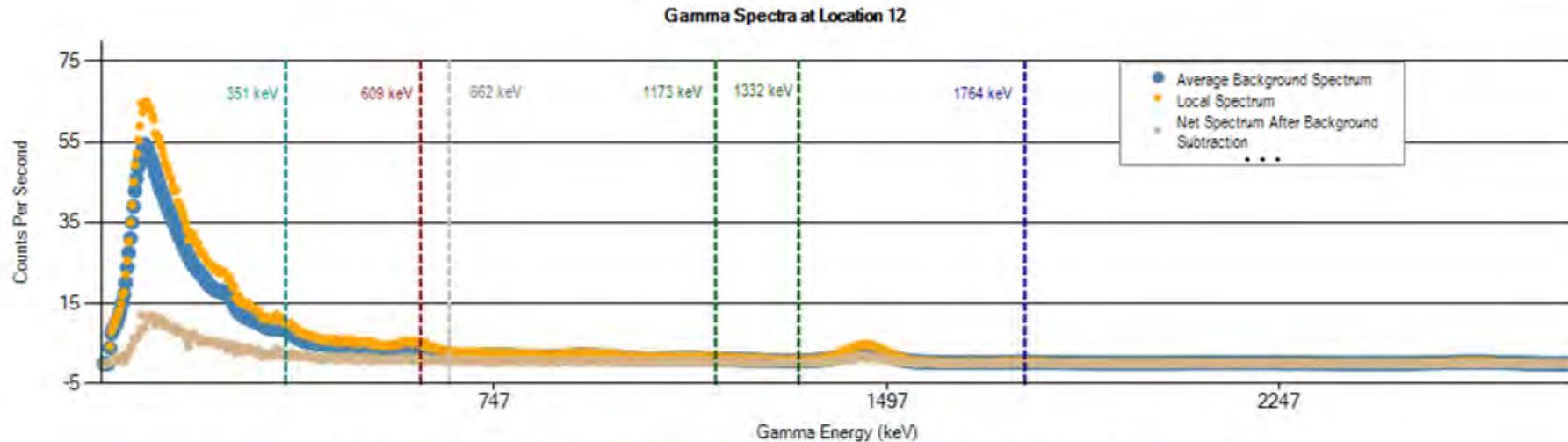
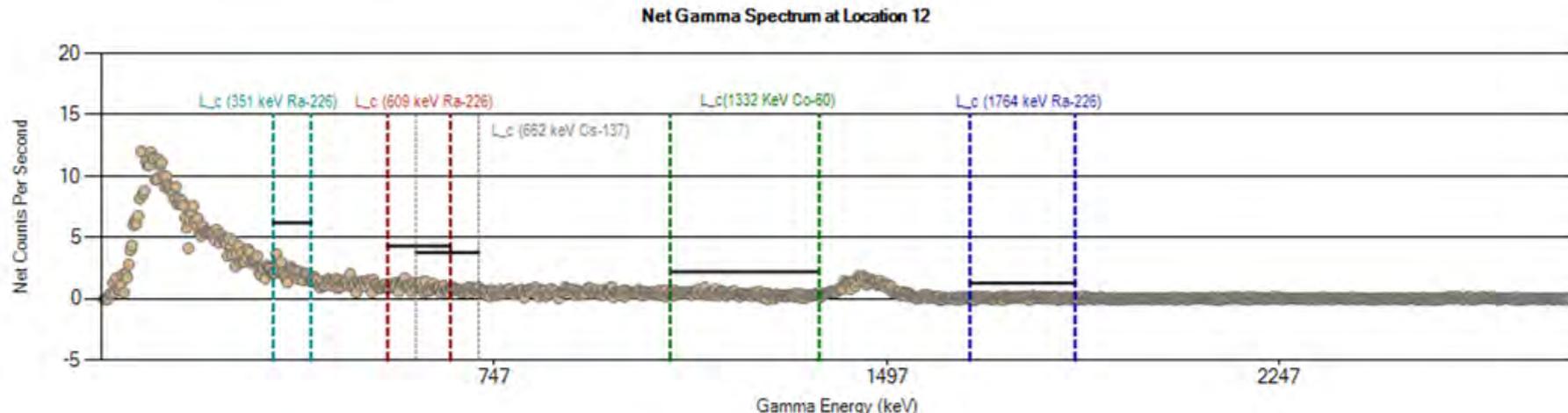
Net Gamma Spectrum at Location 11



Gamma Spectra at Location 11

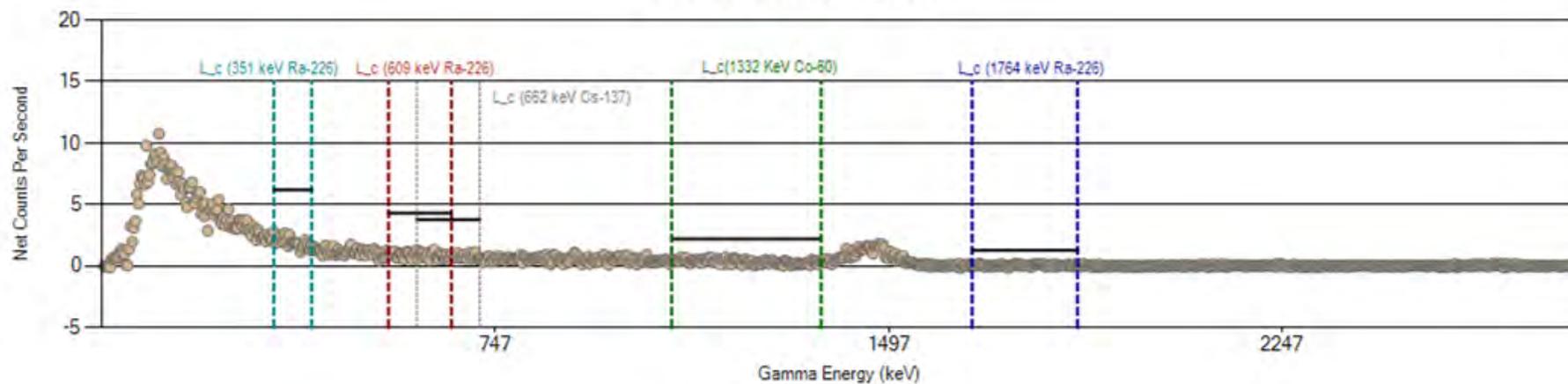


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 11 (cps)	1205	182	26	27	206	192	152	236	131	4642
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

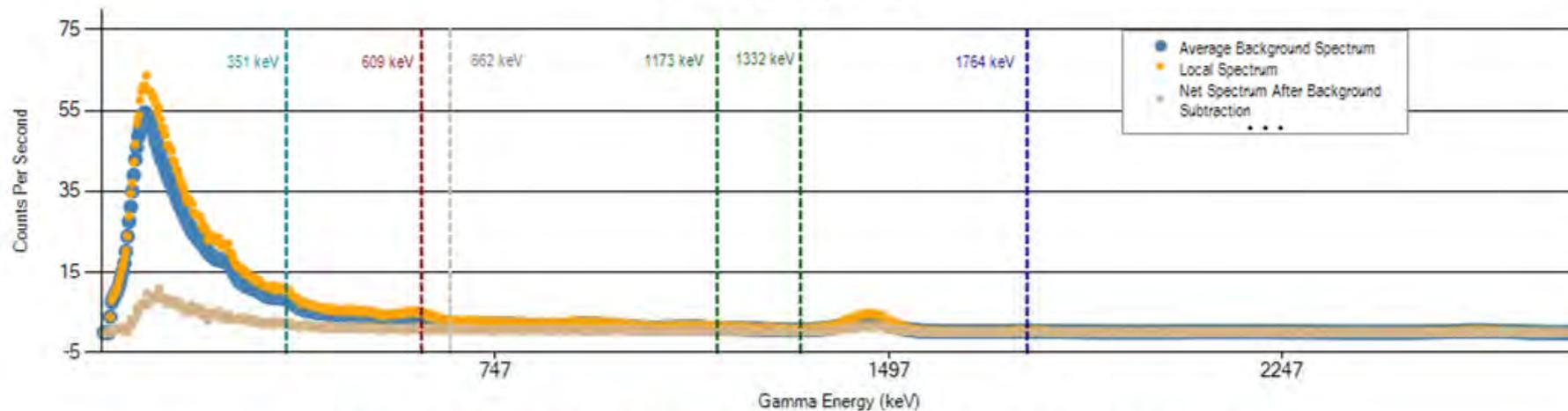


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 12 (cps)	1142	172	27	28	197	181	142	227	125	4529
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 13

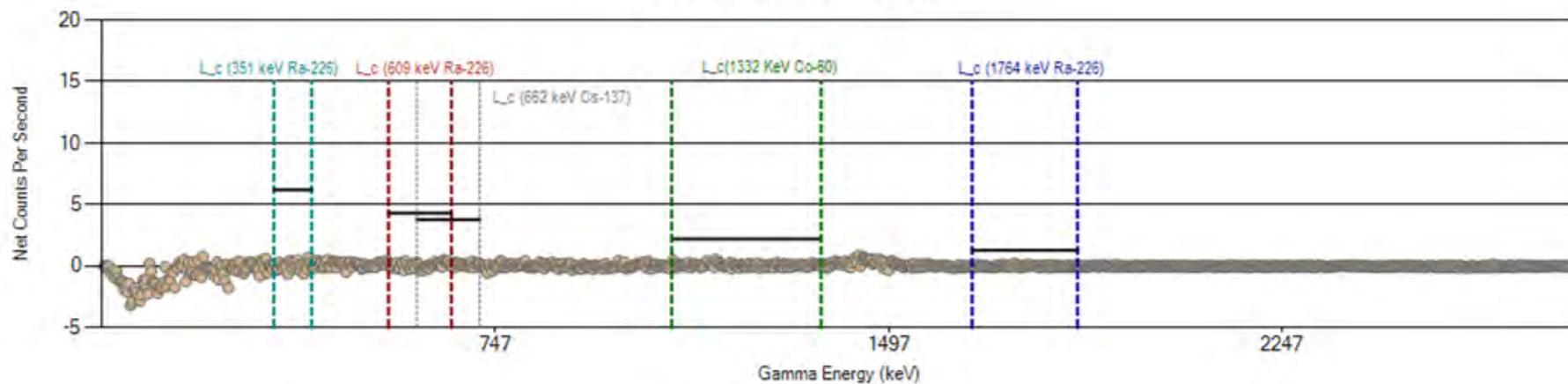


Gamma Spectra at Location 13

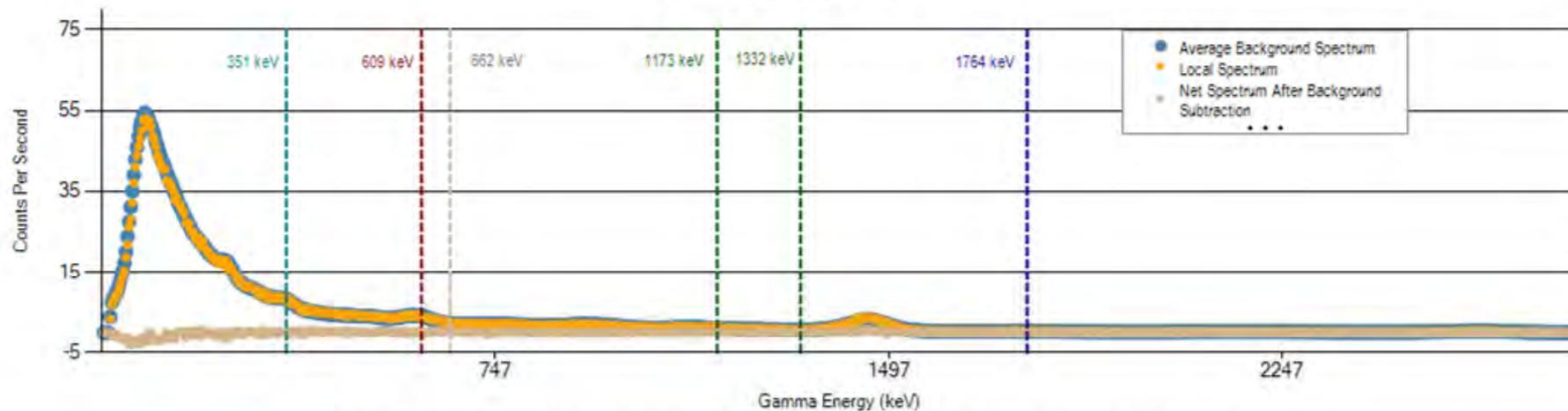


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 13 (cps)	1125	168	25	28	193	177	140	222	123	4408
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

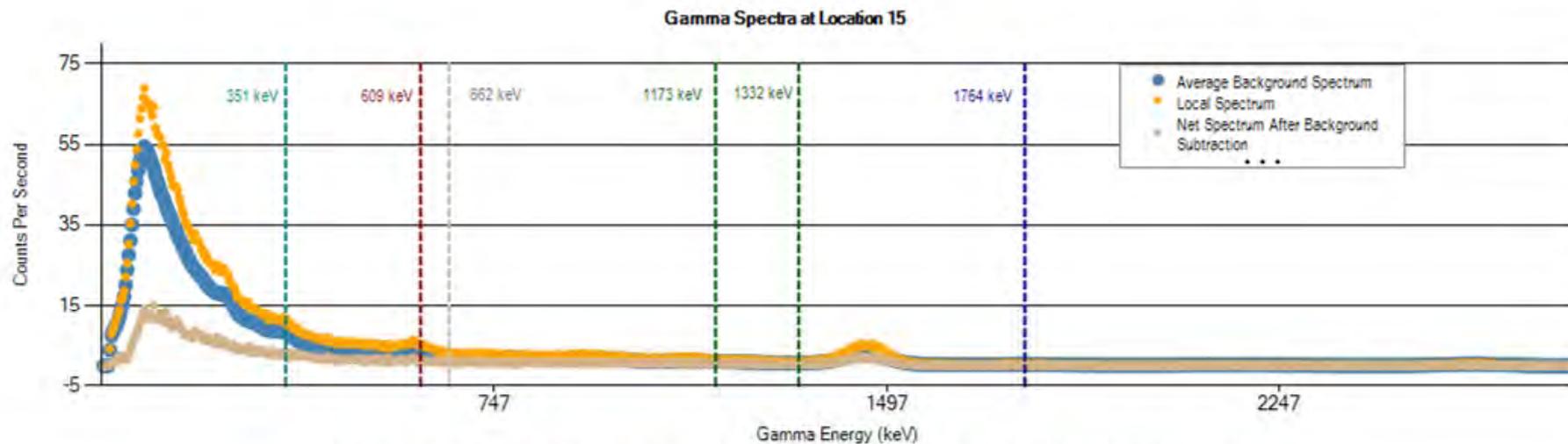
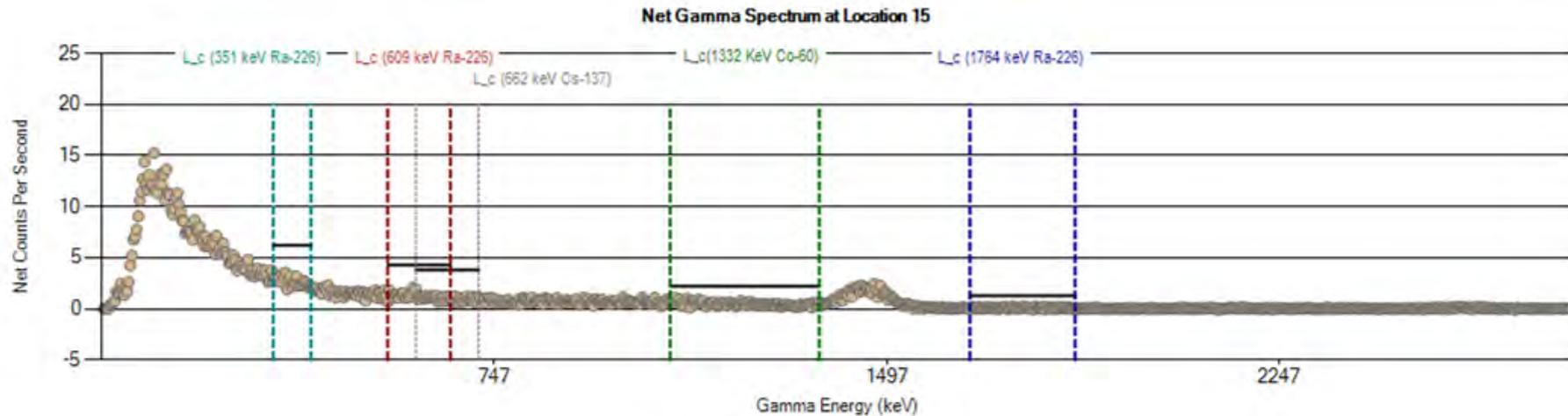
Net Gamma Spectrum at Location 14



Gamma Spectra at Location 14

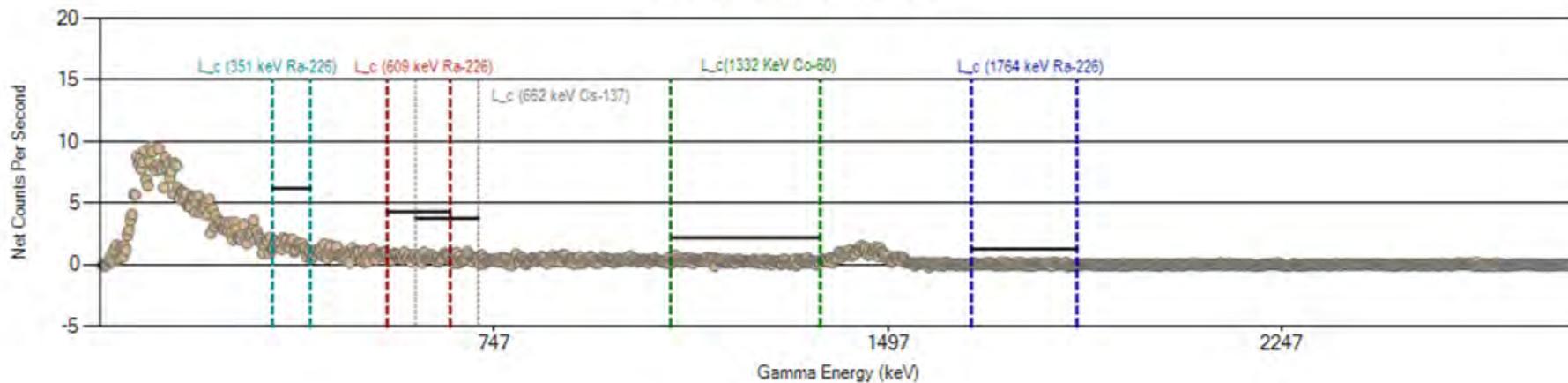


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 14 (cps)	886	128	20	22	156	143	111	175	96	3576
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

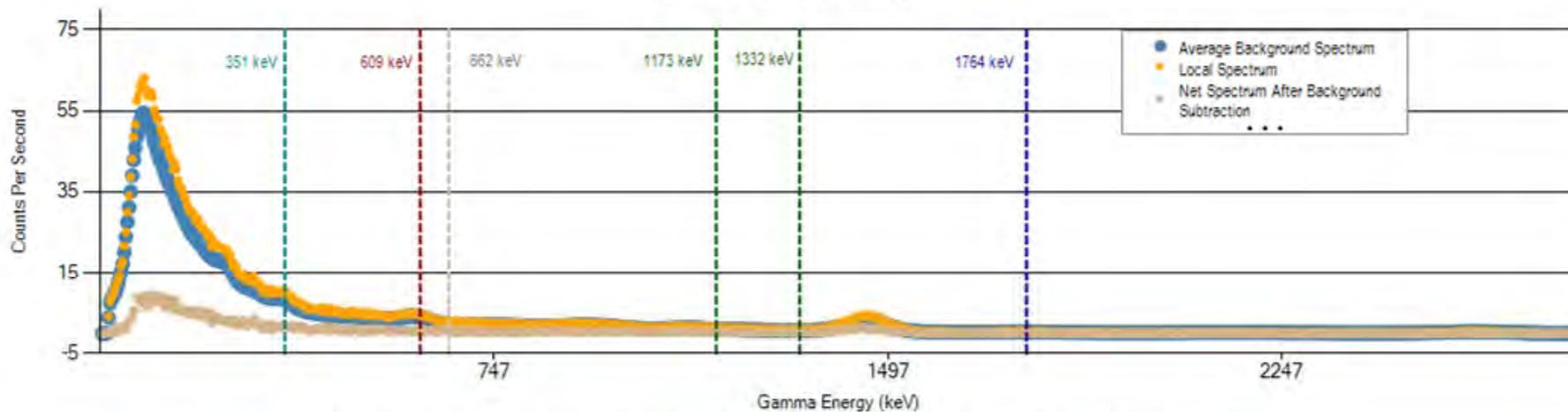


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 15 (cps)	1211	187	26	29	206	190	148	240	133	4730
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 16

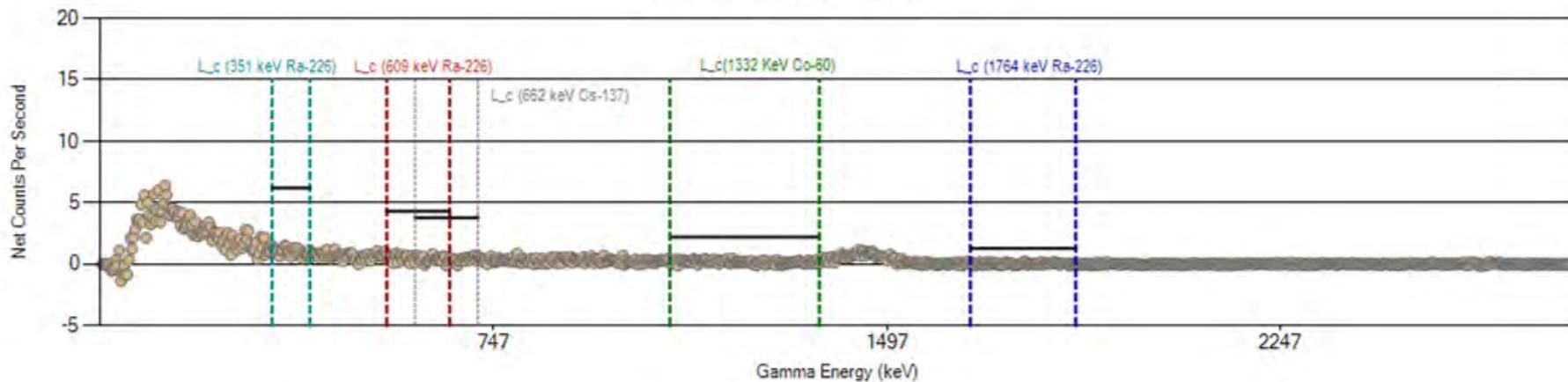


Gamma Spectra at Location 16

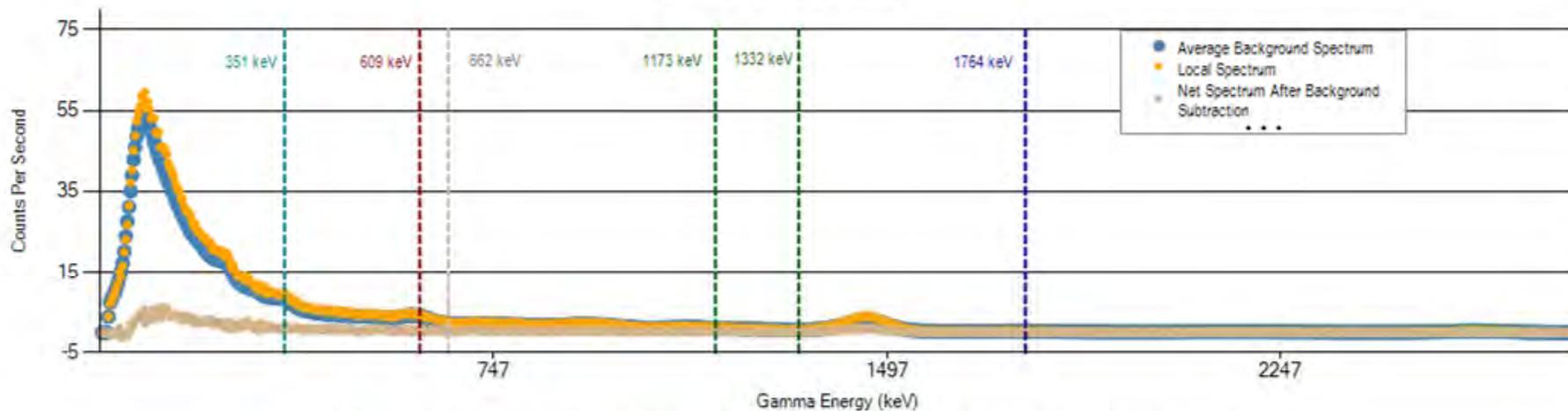


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 16 (cps)	1061	160	24	26	181	165	130	211	119	4311
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 17

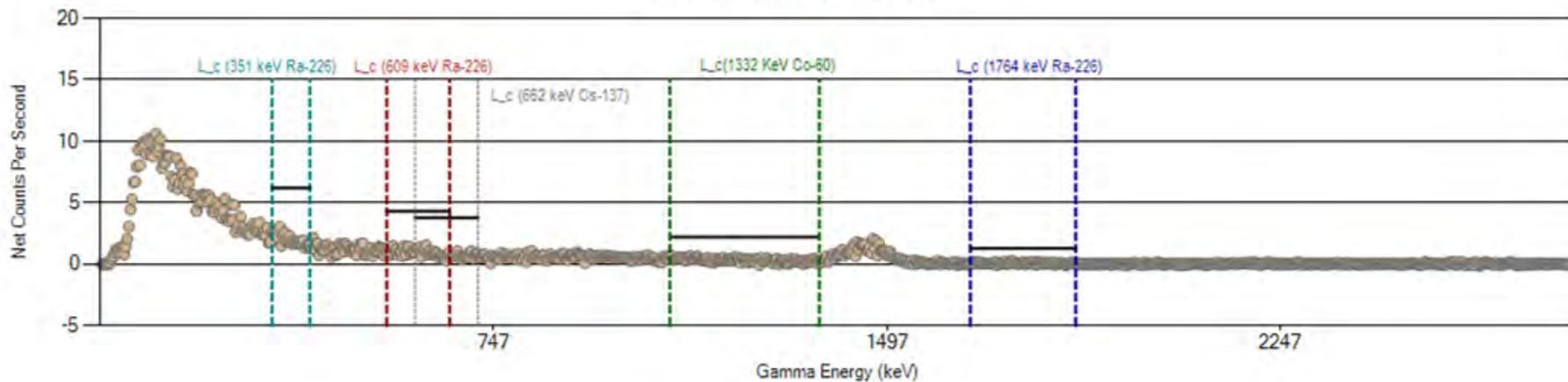


Gamma Spectra at Location 17

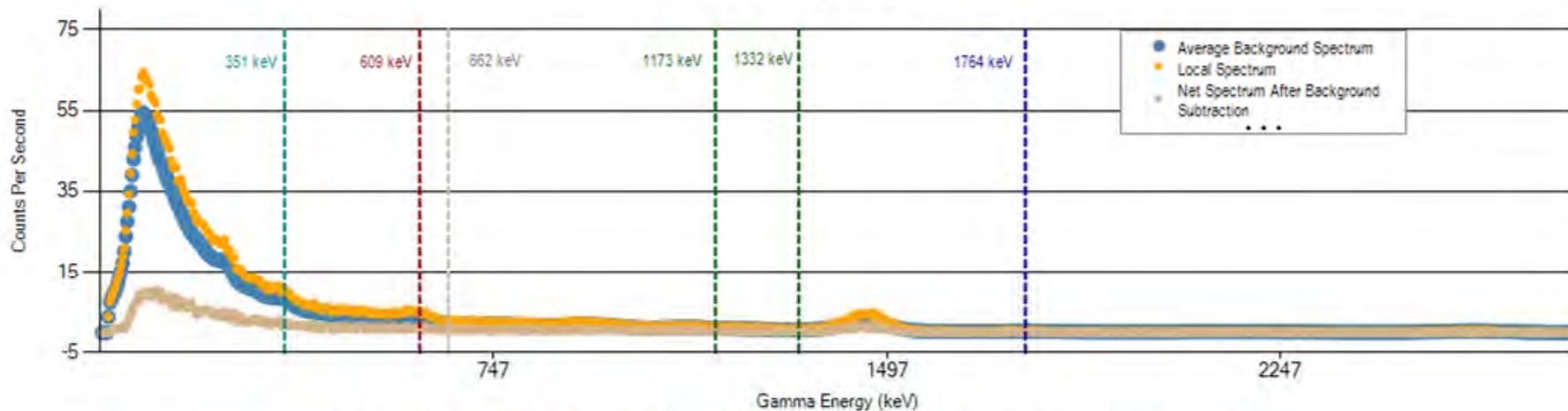


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 17 (cps)	1005	148	23	25	175	158	124	200	106	4043
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 18

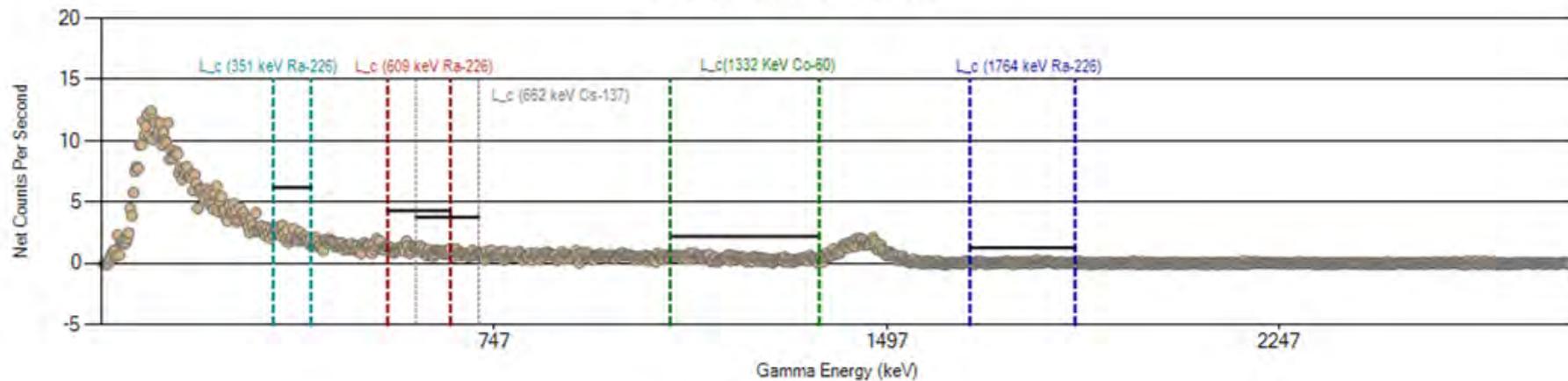


Gamma Spectra at Location 18

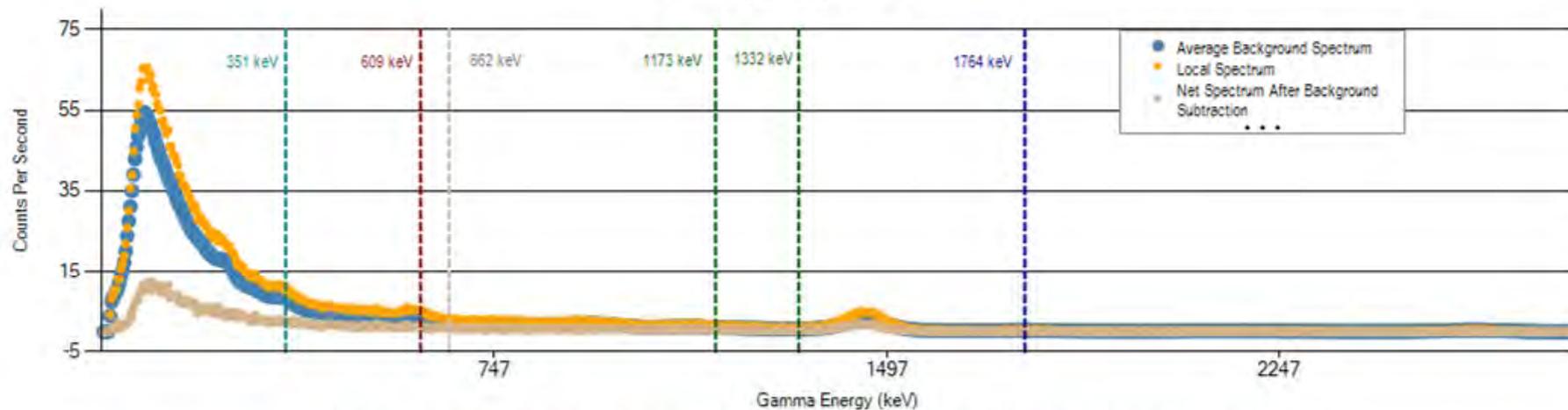


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 18 (cps)	1128	166	26	28	197	180	140	223	121	4472
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 19

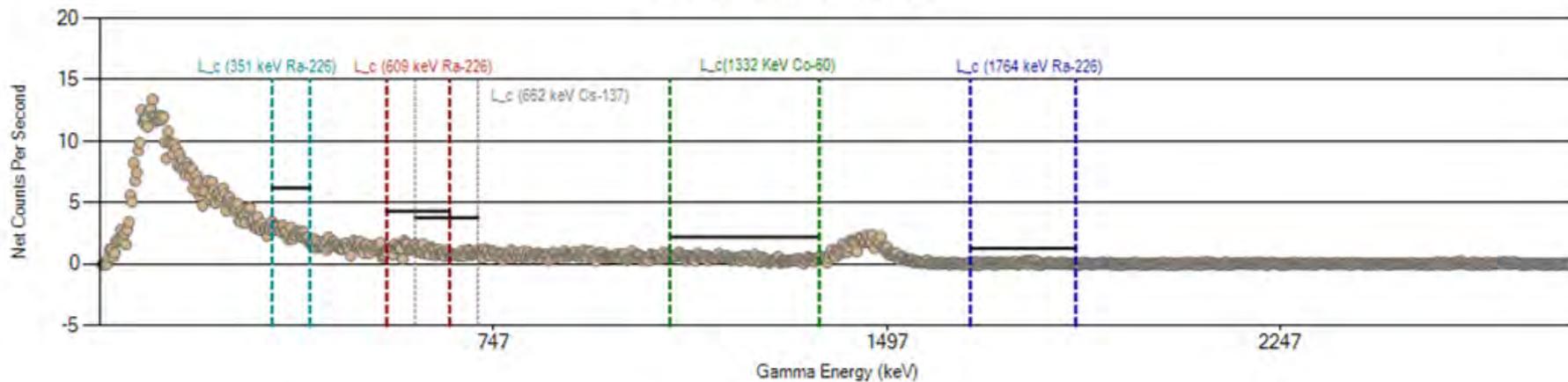


Gamma Spectra at Location 19

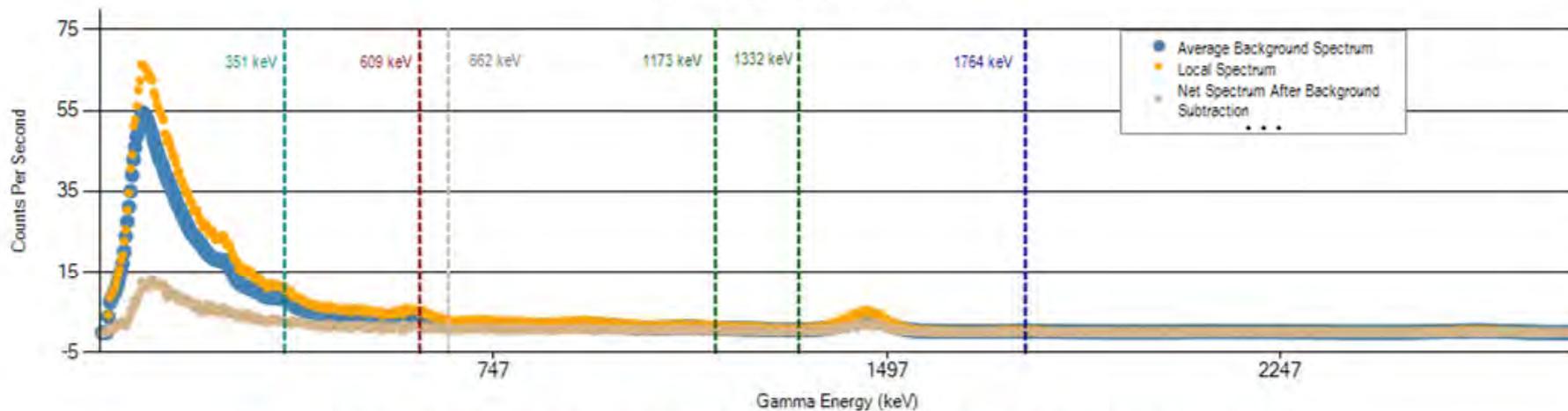


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 19 (cps)	1167	178	25	26	202	184	144	230	128	4583
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 20

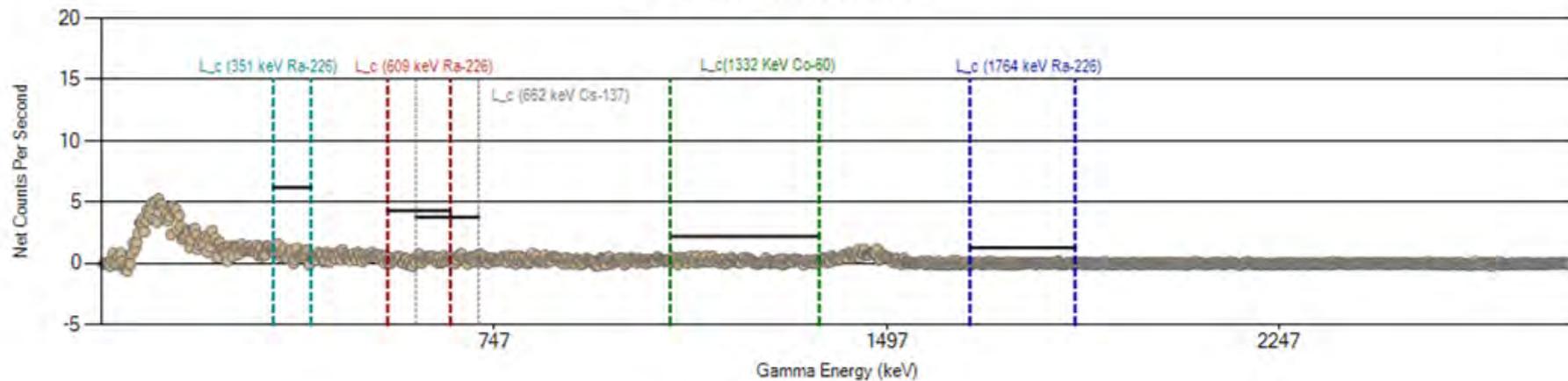


Gamma Spectra at Location 20

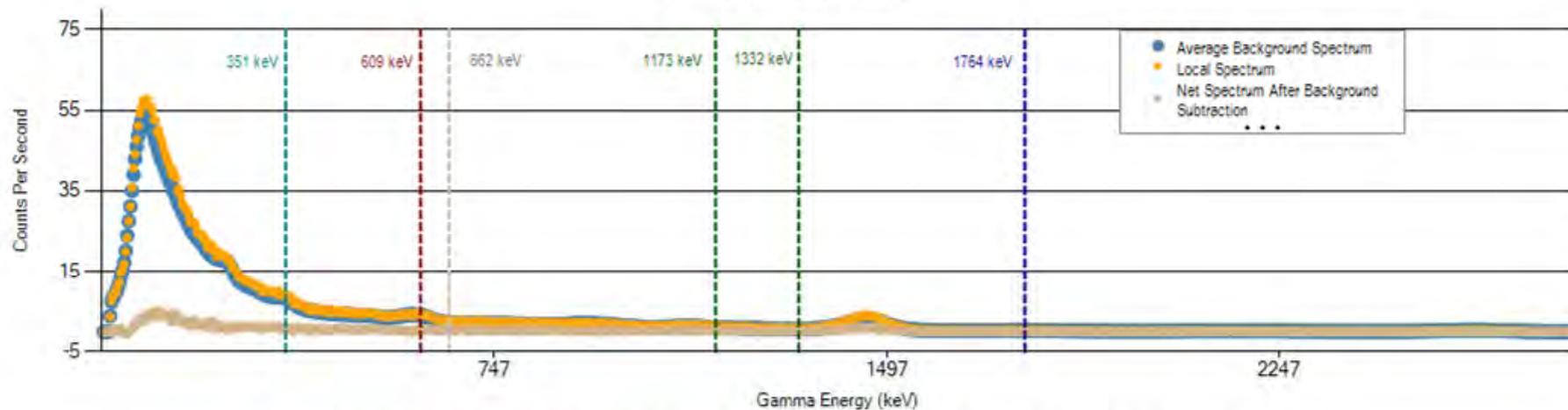


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 20 (cps)	1203	185	26	29	203	188	147	237	133	4680
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 21

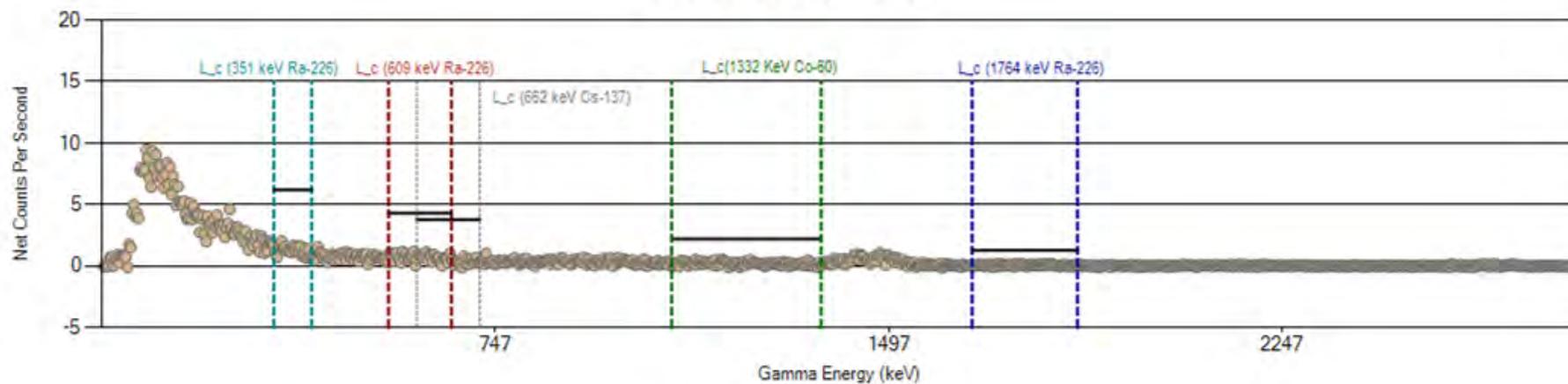


Gamma Spectra at Location 21

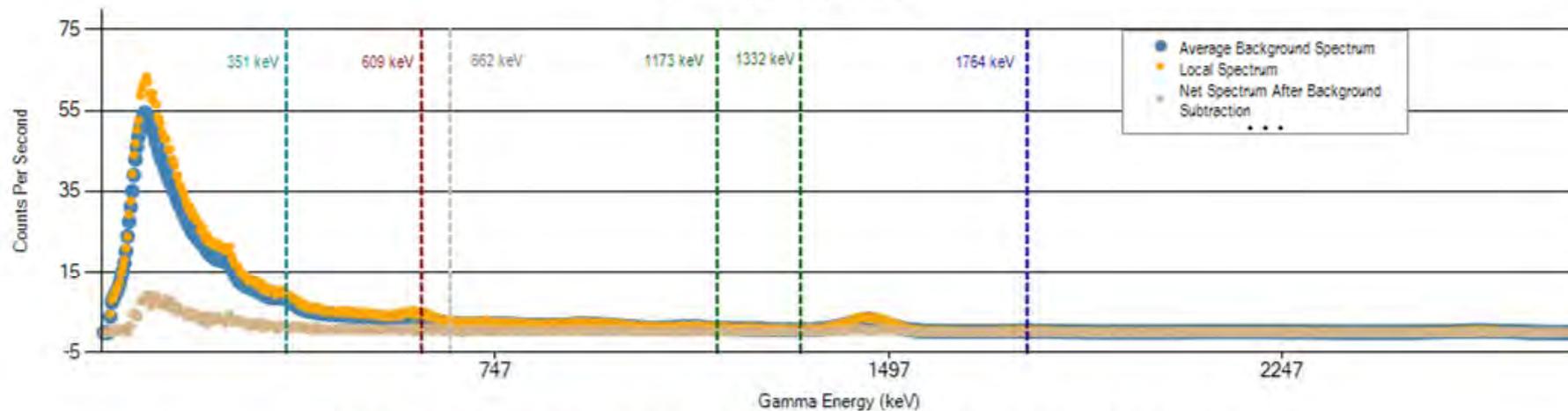


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 21 (cps)	981	144	21	22	171	153	123	193	110	3958
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 22

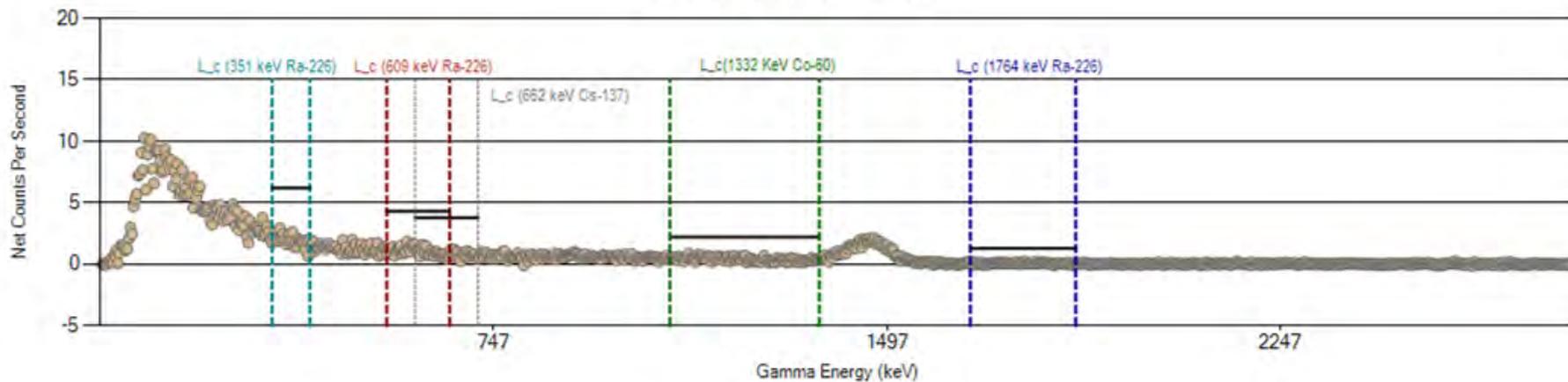


Gamma Spectra at Location 22

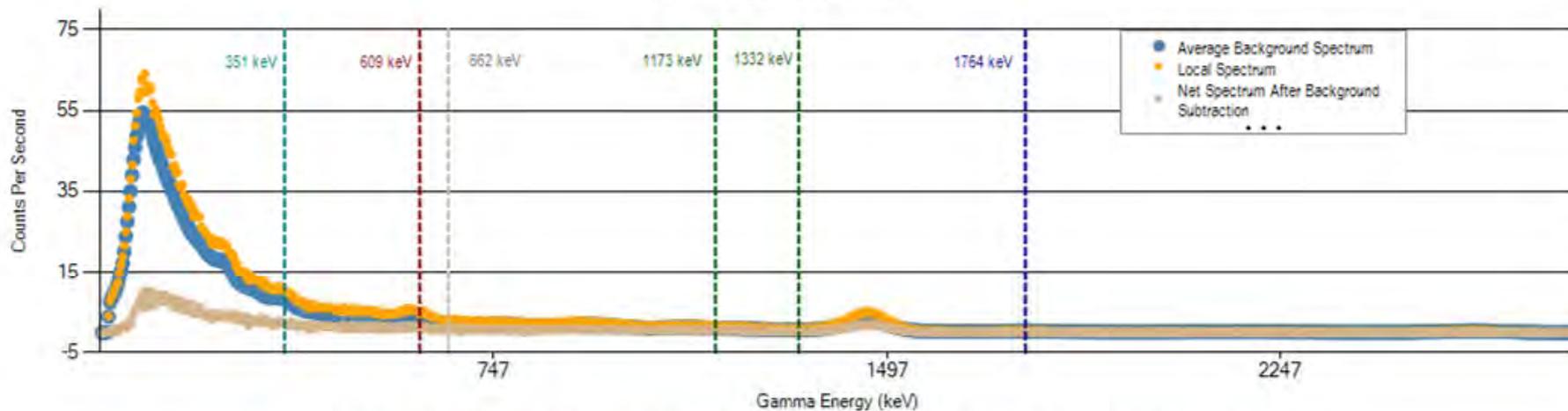


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 22 (cps)	1031	144	25	27	180	169	130	206	108	4227
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 23

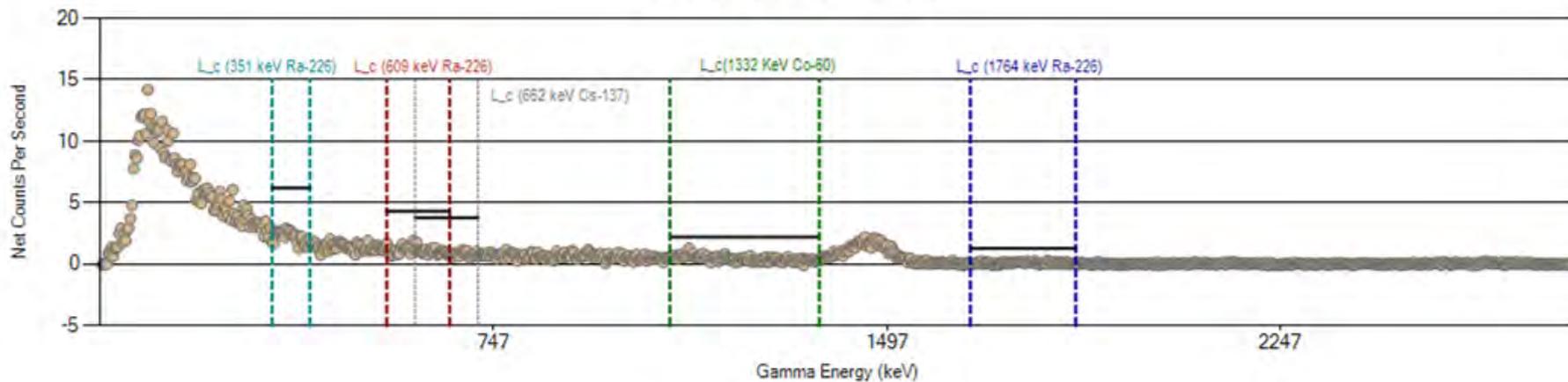


Gamma Spectra at Location 23

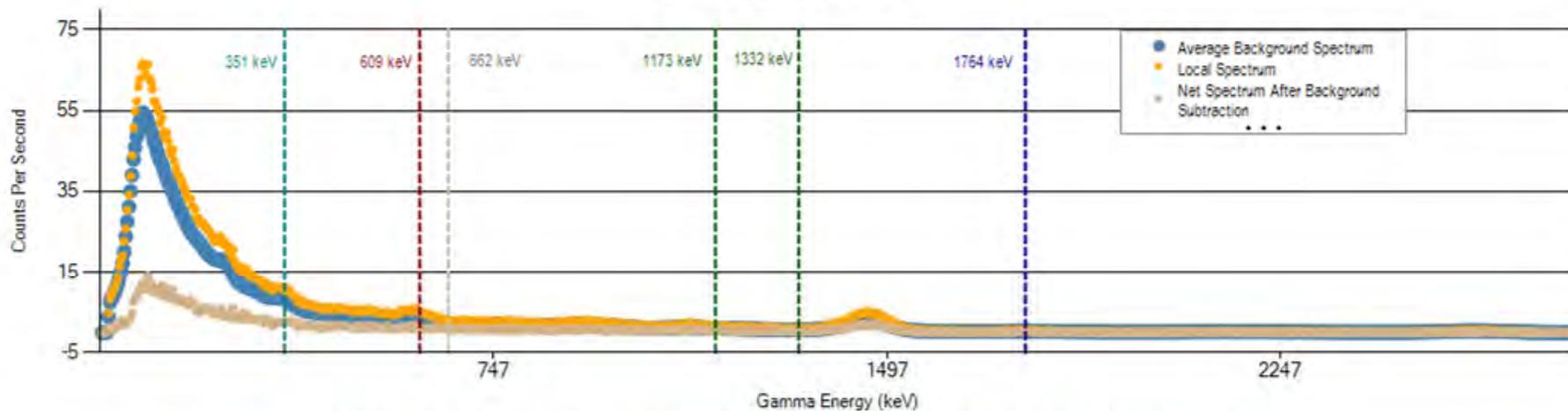


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 23 (cps)	1163	182	25	26	198	183	141	223	129	4466
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

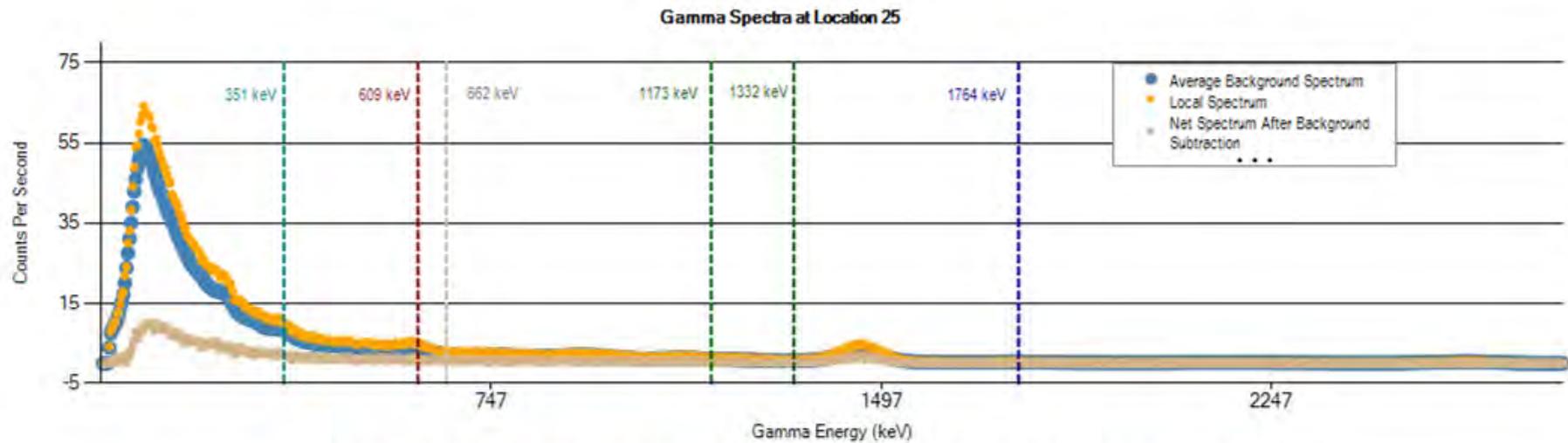
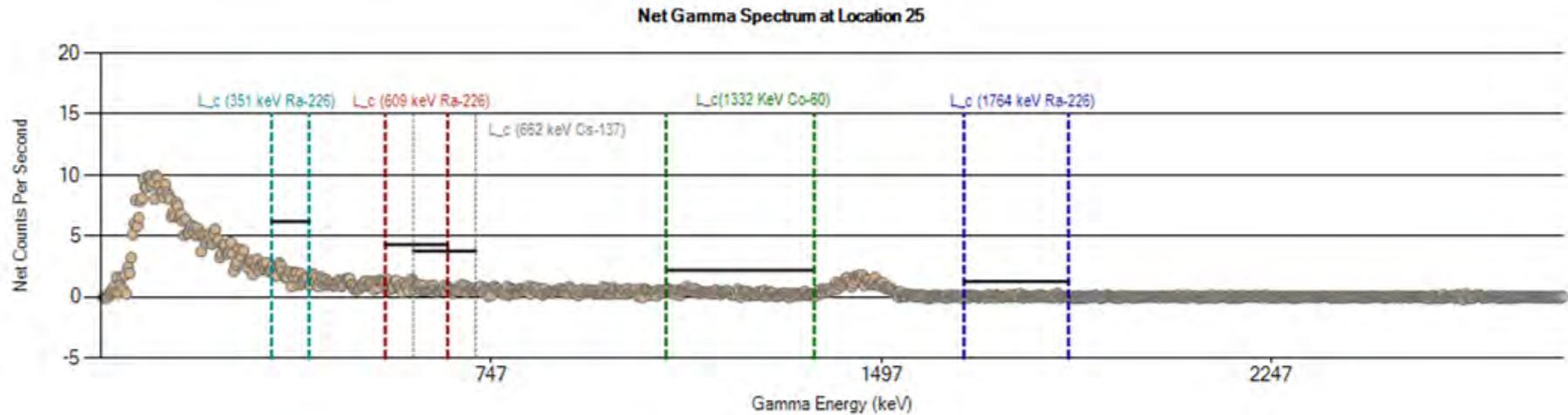
Net Gamma Spectrum at Location 24



Gamma Spectra at Location 24

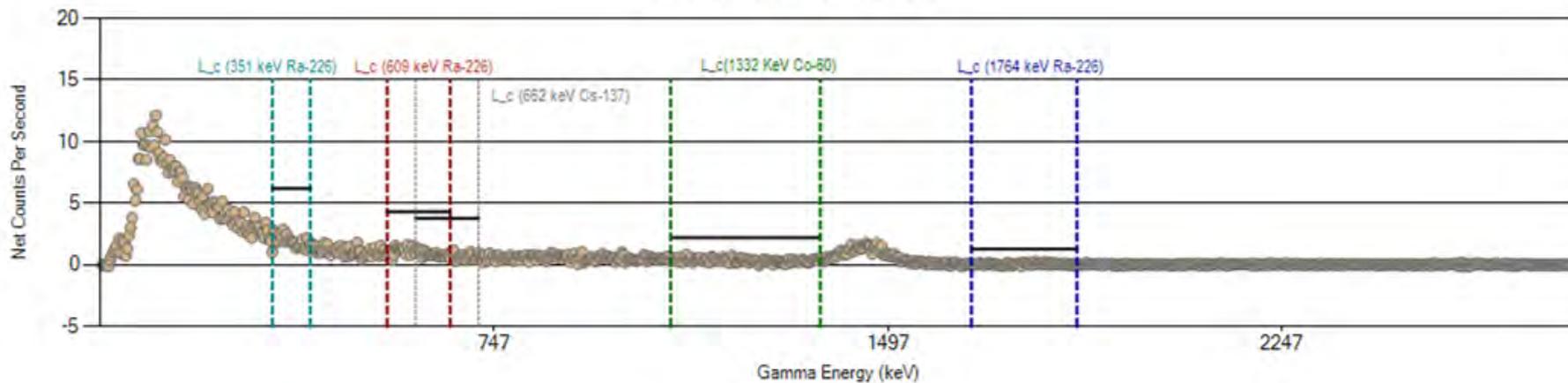


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 24 (cps)	1182	182	27	29	201	185	145	230	130	4614
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

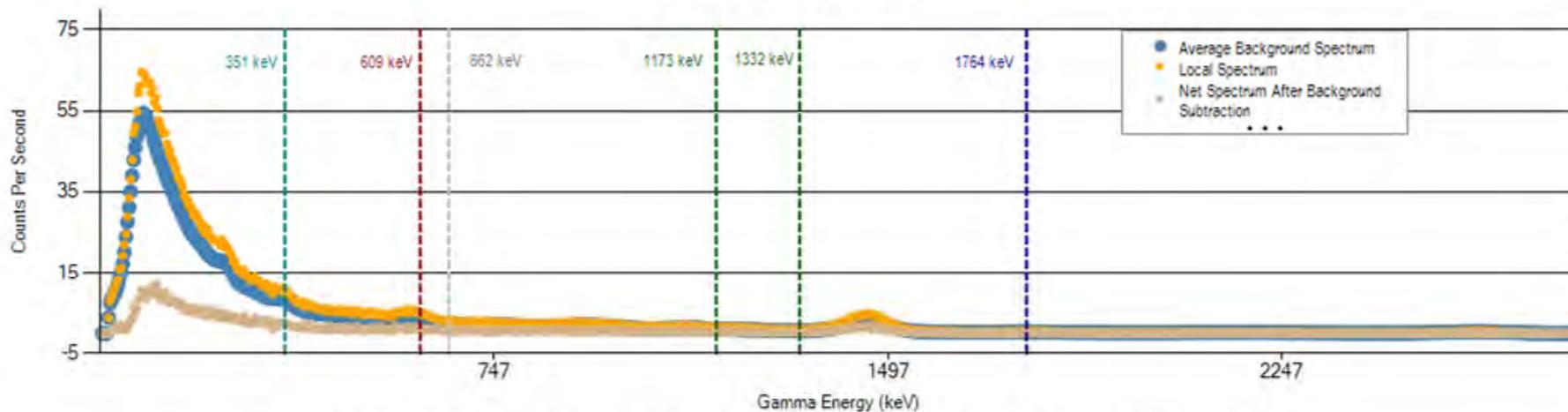


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 25 (cps)	1111	169	25	27	193	174	136	219	121	4419
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 26

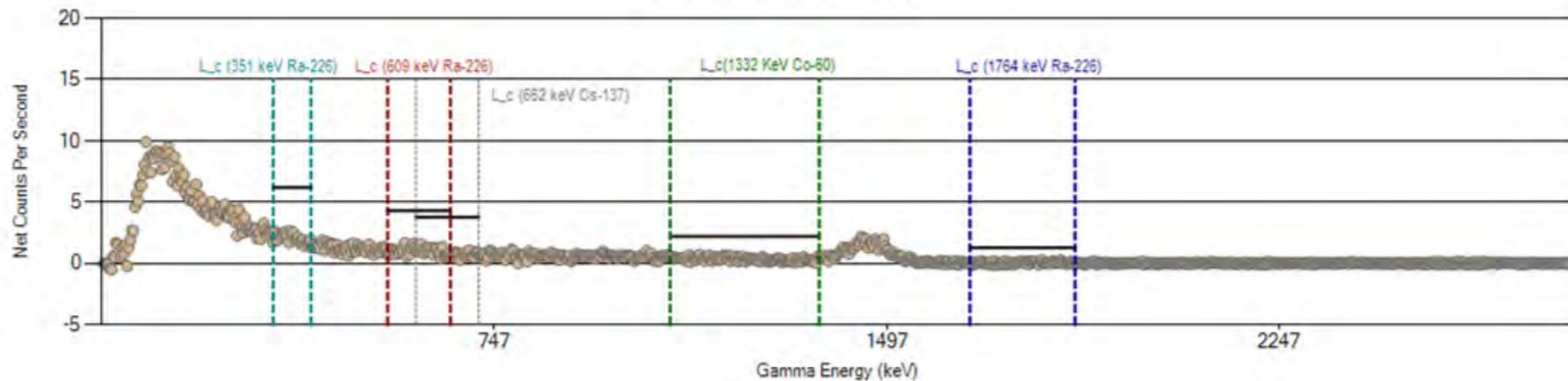


Gamma Spectra at Location 26

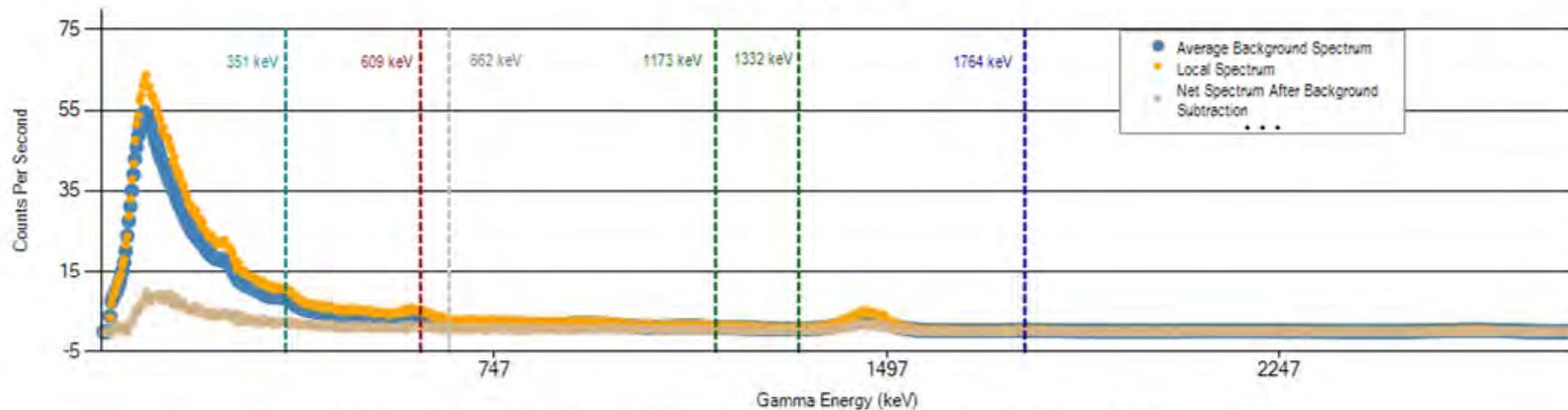


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 26 (cps)	1130	171	25	27	193	182	140	222	123	4471
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 27



Gamma Spectra at Location 27

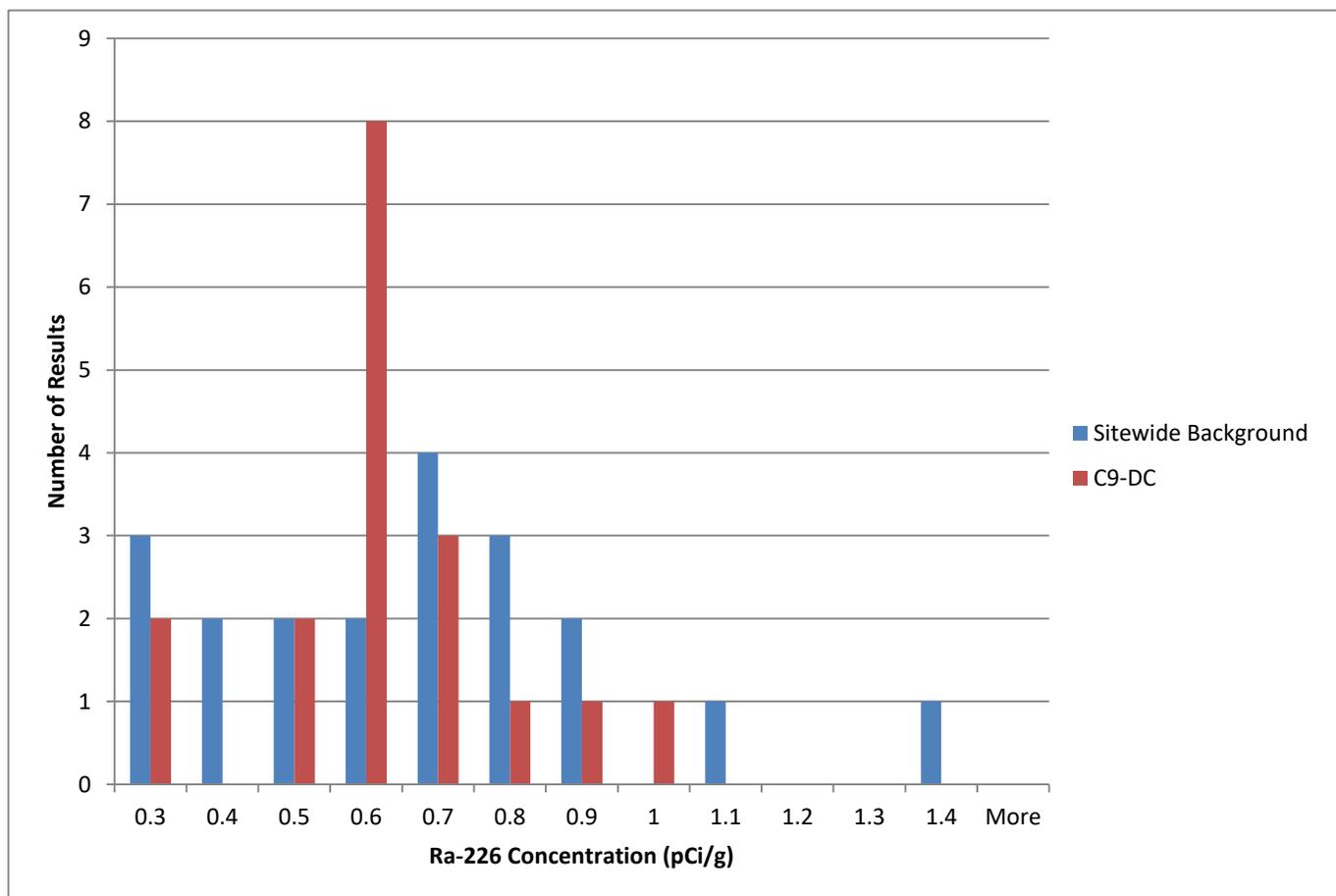


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 27 (cps)	1149	177	25	27	195	182	142	226	124	4446
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Histogram, RSY C9 (DC) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.3	3
0.4	2
0.5	2
0.6	2
0.7	4
0.8	3
0.9	2
1	0
1.1	1
1.2	0
1.3	0
1.4	1
More	0

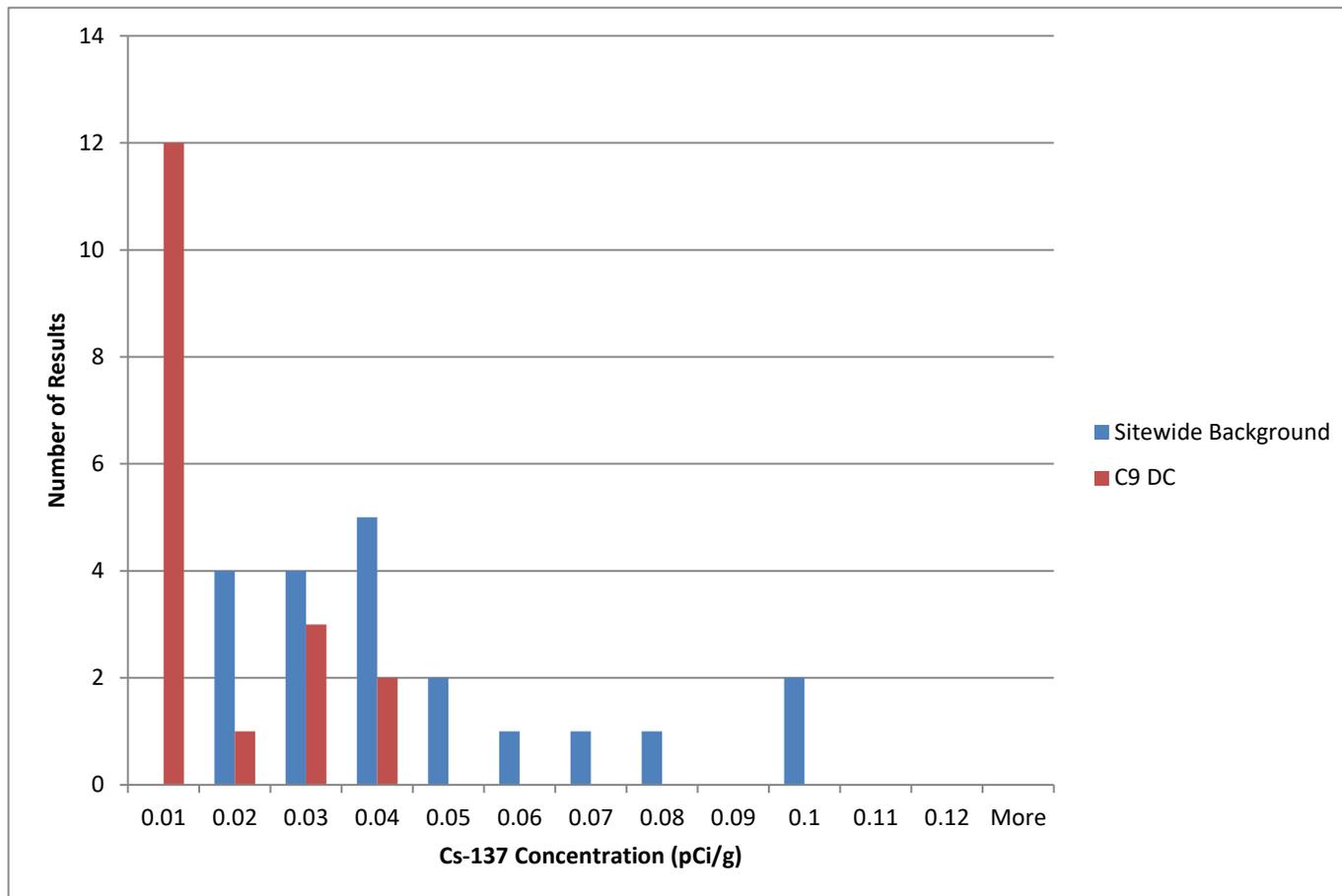
C9-DC	
<i>Bin</i>	<i>Frequency</i>
0.3	2
0.4	0
0.5	2
0.6	8
0.7	3
0.8	1
0.9	1
1	1
1.1	0
1.2	0
1.3	0
1.4	0
More	0



Histogram, RSY C9 (DC) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.01	0
0.02	4
0.03	4
0.04	5
0.05	2
0.06	1
0.07	1
0.08	1
0.09	0
0.1	2
0.11	0
0.12	0
More	0

C9 DC	
<i>Bin</i>	<i>Frequency</i>
0.01	12
0.02	1
0.03	3
0.04	2
0.05	0
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-30734-2

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Eddie Kalombo

Micha Korrinhizer

Authorized for release by:

10/10/2018 4:25:21 PM

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1

2

3

4

5

6

7

8

9

10

11

12



Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	7
Definitions/Glossary	8
Method Summary	9
Sample Summary	10
Client Sample Results	11
QC Sample Results	21
QC Association Summary	23
Tracer Carrier Summary	24

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Job ID: 160-30734-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-30734-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup
Method 3665A: Sulfuric Acid/Permanganate Cleanup

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Job ID: 160-30734-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 09/14/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0° C.

TOTAL BETA STRONTIUM (GFPC)

Samples PE2-RSYC9-DC-S001 (160-30734-1) and PE2-RSYC9-DC-S011 (160-30734-11) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 09/14/2018, prepared on 09/18/2018 and analyzed on 10/08/2018.

The following samples in batch 160-390125 could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYC9-DC-S001 (160-30734-1) and PE2-RSYC9-DC-S011 (160-30734-11). The samples contained detritus material and rocks of varying sizes.

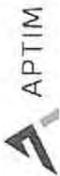
No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYC9-DC-S001 (160-30734-1), PE2-RSYC9-DC-S002 (160-30734-2), PE2-RSYC9-DC-S003 (160-30734-3), PE2-RSYC9-DC-S004 (160-30734-4), PE2-RSYC9-DC-S005 (160-30734-5), PE2-RSYC9-DC-S006 (160-30734-6), PE2-RSYC9-DC-S007 (160-30734-7), PE2-RSYC9-DC-S008 (160-30734-8), PE2-RSYC9-DC-S009 (160-30734-9), PE2-RSYC9-DC-S010 (160-30734-10), PE2-RSYC9-DC-S011 (160-30734-11), PE2-RSYC9-DC-S012 (160-30734-12), PE2-RSYC9-DC-S013 (160-30734-13), PE2-RSYC9-DC-S014 (160-30734-14), PE2-RSYC9-DC-S015 (160-30734-15), PE2-RSYC9-DC-S016 (160-30734-16), PE2-RSYC9-DC-S017 (160-30734-17) and PE2-RSYC9-DC-S018 (160-30734-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 09/14/2018, prepared on 09/18/2018 and analyzed on 10/09/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met for samples PE2-RSYC9-DC-S004 (160-30734-4), PE2-RSYC9-DC-S009 (160-30734-9), PE2-RSYC9-DC-S010 (160-30734-10), PE2-RSYC9-DC-S013 (160-30734-13), PE2-RSYC9-DC-S015 (160-30734-15) and PE2-RSYC9-DC-S018 (160-30734-18) in batch 160-389974. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

CHAIN OF CUSTODY

Ref. Document # PE2_RSYC9_DC#598

Page 1 of 2

Project Number: 500506

CTO-013 RSYC9 Deconstruction
Systematic

Project Name: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 9.13.18

Waybill Number: 1266N5451945681668

Lab Destination: TestAmerica (St. Louis Lab)

13715 Rider Trail North

Earth City, MO 63045

Lab Contact Name / ph. #: Rhonda Kidenhower (314) 298-8566

Project Manager: Nels Johnson

(Name & phone #)

Send Report To: Eddie Katombo
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA, 94520

Sampler's Name(s): Jordan Ramirez

Sample ID Number	Sample Description	Date	Time	Method	Matrix	# of containers	Preservative (water)	Container Type
PE2-RSYC9-DC-S001	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1232	G	SO	1	16 oz. plastic jar	
PE2-RSYC9-DC-S002	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1239	G	SO	1	16 oz. plastic jar	
PE2-RSYC9-DC-S003	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1246	G	SO	1	16 oz. plastic jar	
PE2-RSYC9-DC-S004	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1253	G	SO	1	16 oz. plastic jar	
PE2-RSYC9-DC-S005	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1300	G	SO	1	16 oz. plastic jar	
PE2-RSYC9-DC-S006	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1307	G	SO	1	16 oz. plastic jar	
PE2-RSYC9-DC-S007	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1314	G	SO	1	16 oz. plastic jar	
PE2-RSYC9-DC-S008	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1321	G	SO	1	16 oz. plastic jar	
PE2-RSYC9-DC-S009	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1328	G	SO	1	16 oz. plastic jar	
PE2-RSYC9-DC-S010	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1336	G	SO	1	16 oz. plastic jar	

Special Instructions:

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g. 7 days ingrown draft and follow with 21 days final.

Level Of QC Required: 24-hr 3-day 10-day 11

Standard TAT - 10-day 3-day 10-day 11

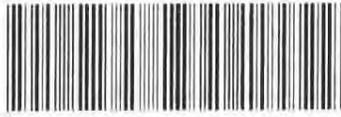
Relinquished By: Jordan Ramirez Date: 9.13.18 Time: 1600
Relinquished By: Eddie Katombo Date: 9.13.18 Time: 1600

Received By: Nicholas Chen Date: 9.13.18 Time: 0845

Method Codes: C = Composite G = Grab

Matrix Codes: SO = Soil DW = Drinking Water SL = Sludge GW = Ground Water WW = Waste Water A = Air

Analyses Requested	Gamma Spec (EPA 191.1 M) - Full 21 day in-growth preliminary results and (7 day in-growth for full gamma results)	Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)	Dose Rate μ R/Hr
	N/A	N/A	N/A	
	X	X	X	5
	X			5
	X			5
	X			5
	X			5
	X			5
	X			5
	X			5
	X			5
	X			5
	X			5
	X			5
	X			5



160-30734 Chain of Custody





APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

CHAIN OF CUSTODY

Project Number: 500506

CTO-013 RSYC9 Deconstruction
Systematic

Project Name: Systematic

Project Location: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 9.13.18

Waybill Number: 1766Y545139568 1668

Lab Destination: TestAmerica (St. Louis Lab)

13715 Rider Trail North

Earth, City, MO 63045

Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Project Manager: Nels Johnson

(Name & phone #)

Send Report To: Eddie Katombo

Phone/Fax Number: 415-987-0760

Address: 4005 Port Chicago Hwy

City: Concord, CA, 94520

Sampler's Name(s): *Jean Paul Ramirez*

Sample ID Number	Sample Description	Collection Information		Matrix	# of containers	Preservative (water)		Dose Rate µR/hr
		Date	Time			Preservative (soil)	Container Type	
PE2-RSYC9-DC-S011	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1343	SO	1	16 oz. plastic jar		
PE2-RSYC9-DC-S012	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1349	SO	1	16 oz. plastic jar		5
PE2-RSYC9-DC-S013	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1400	SO	1	16 oz. plastic jar		5
PE2-RSYC9-DC-S014	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1354	SO	1	16 oz. plastic jar		5
PE2-RSYC9-DC-S015	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1406	SO	1	16 oz. plastic jar		5
PE2-RSYC9-DC-S016	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1412	SO	1	16 oz. plastic jar		5
PE2-RSYC9-DC-S017	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1418	SO	1	16 oz. plastic jar		5
PE2-RSYC9-DC-S018	Parcel E-2 RSYC9 Deconstruction Systematic	9/16/18	1425	SO	1	16 oz. plastic jar		5

Analyses Requested	Result
Total Strontium (EPA 905 MOD)	N/A
Strontium 90 (EPA 905 MOD)	N/A

Gamma Spec (EPA 191.1 M) - Full 21 day in growth for preliminary results and (7 day in growth for full gamma results)

Special Instructions:

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g. 7 days ingrown draft and follow with 21 days final.

Level Of QC Required: 24-hr 3-day 10-day III Project Specific:

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
<i>Jean Paul Ramirez</i>	9.13.18	1600	Eddie Katombo	9.13.18	1000
<i>Eddie Katombo</i>	9.13.18	1600	<i>Rhonda Ridenhower</i>	9-14-18	0845
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

Method Codes: C = Composite G = Grab
Matrix Codes: SO = Soil DW = Drinking Water SL = Sludge GW = Ground Water WW = Waste Water A = Air
ABS=Asbestos, PO=Pipe Opening



Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-30734-2

Login Number: 30734**List Source: TestAmerica St. Louis****List Number: 1****Creator: Press, Nicholas B**

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy

None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-30734-1	PE2-RSYC9-DC-S001	Solid	09/06/18 12:32	09/14/18 08:45
160-30734-2	PE2-RSYC9-DC-S002	Solid	09/06/18 12:39	09/14/18 08:45
160-30734-3	PE2-RSYC9-DC-S003	Solid	09/06/18 12:46	09/14/18 08:45
160-30734-4	PE2-RSYC9-DC-S004	Solid	09/06/18 12:53	09/14/18 08:45
160-30734-5	PE2-RSYC9-DC-S005	Solid	09/06/18 13:00	09/14/18 08:45
160-30734-6	PE2-RSYC9-DC-S006	Solid	09/06/18 13:07	09/14/18 08:45
160-30734-7	PE2-RSYC9-DC-S007	Solid	09/06/18 13:14	09/14/18 08:45
160-30734-8	PE2-RSYC9-DC-S008	Solid	09/06/18 13:21	09/14/18 08:45
160-30734-9	PE2-RSYC9-DC-S009	Solid	09/06/18 13:28	09/14/18 08:45
160-30734-10	PE2-RSYC9-DC-S010	Solid	09/06/18 13:36	09/14/18 08:45
160-30734-11	PE2-RSYC9-DC-S011	Solid	09/06/18 13:43	09/14/18 08:45
160-30734-12	PE2-RSYC9-DC-S012	Solid	09/06/18 13:49	09/14/18 08:45
160-30734-13	PE2-RSYC9-DC-S013	Solid	09/06/18 14:00	09/14/18 08:45
160-30734-14	PE2-RSYC9-DC-S014	Solid	09/06/18 13:54	09/14/18 08:45
160-30734-15	PE2-RSYC9-DC-S015	Solid	09/06/18 14:06	09/14/18 08:45
160-30734-16	PE2-RSYC9-DC-S016	Solid	09/06/18 14:12	09/14/18 08:45
160-30734-17	PE2-RSYC9-DC-S017	Solid	09/06/18 14:18	09/14/18 08:45
160-30734-18	PE2-RSYC9-DC-S018	Solid	09/06/18 14:25	09/14/18 08:45

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S001

Lab Sample ID: 160-30734-1

Date Collected: 09/06/18 12:32

Matrix: Solid

Date Received: 09/14/18 08:45

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0631		0.0674	0.0676	0.331	0.0502	pCi/g	09/18/18 18:36	10/08/18 04:45	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	83.8		40 - 110					09/18/18 18:36	10/08/18 04:45	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.768		0.204	0.219		0.0407	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Actinium-227	0.307	U	0.753	0.754		0.450	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Bismuth-212	-0.500	U	1.15	1.15		0.906	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Bismuth-214	0.637		0.176	0.188		0.0633	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Cesium-137	0.0101	U	0.0768	0.0768	0.0700	0.0619	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Cobalt-60	0.0453		0.0819	0.0821	0.200	0.0378	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Lead-210	0.385	U	1.96	1.96		1.60	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Lead-212	0.628		0.125	0.149		0.0624	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Lead-214	0.869		0.157	0.181		0.0505	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Potassium-40	13.7		2.01	2.45		0.287	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Protactinium-231	0.000	U	0.858	0.858		2.90	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Radium-226	0.637		0.176	0.188	0.700	0.0633	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Radium-228	0.768		0.204	0.219		0.0407	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thallium-208	0.259		0.0922	0.0960		0.0337	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thorium-228	0.628		0.125	0.149		0.0624	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thorium-232	0.768		0.204	0.219		0.0407	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thorium-234	0.129	U	0.801	0.801		0.651	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Uranium-235	-0.302	U	0.434	0.436		0.544	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Uranium-238	0.129	U	0.801	0.801		0.651	pCi/g	09/18/18 10:19	10/09/18 14:18	1

Client Sample ID: PE2-RSYC9-DC-S002

Lab Sample ID: 160-30734-2

Date Collected: 09/06/18 12:39

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.822		0.150	0.172		0.0210	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Actinium-227	-0.338	U	0.173	0.178		0.368	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Bismuth-212	-0.0511	U	0.679	0.679		0.562	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Bismuth-214	0.613		0.131	0.146		0.0445	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Cesium-137	0.0289	U	0.0471	0.0472	0.0700	0.0363	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Cobalt-60	0.0717		0.0506	0.0511	0.200	0.0195	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Lead-210	0.652	U	1.38	1.38		0.839	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Lead-212	0.730		0.0938	0.133		0.0374	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Lead-214	0.612		0.119	0.135		0.0645	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Potassium-40	14.2		1.45	2.05		0.212	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Protactinium-231	0.000	U	0.841	0.841		1.99	pCi/g	09/18/18 10:19	10/09/18 14:17	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S002

Lab Sample ID: 160-30734-2

Date Collected: 09/06/18 12:39

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium-226	0.613		0.131	0.146	0.700	0.0445	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Radium-228	0.822		0.150	0.172		0.0210	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Thallium-208	0.272		0.0539	0.0608		0.0111	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Thorium-228	0.730		0.0938	0.133		0.0374	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Thorium-232	0.822		0.150	0.172		0.0210	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Thorium-234	-0.382	U	0.524	0.526		1.04	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Uranium-235	-0.170	U	0.490	0.490		0.400	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Uranium-238	-0.382	U	0.524	0.526		1.04	pCi/g	09/18/18 10:19	10/09/18 14:17	1

Client Sample ID: PE2-RSYC9-DC-S003

Lab Sample ID: 160-30734-3

Date Collected: 09/06/18 12:46

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.932		0.223	0.242		0.168	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Actinium-227	0.163	U	0.690	0.690		0.423	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Bismuth-212	0.640	U	1.14	1.15		0.903	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Bismuth-214	0.923		0.151	0.178		0.0144	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Cesium-137	0.0360	U	0.0704	0.0705	0.0700	0.0549	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Cobalt-60	-0.0726	U	0.132	0.132	0.200	0.0628	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Lead-210	1.14		1.61	1.62		1.10	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Lead-212	0.874		0.127	0.157		0.0573	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Lead-214	0.830		0.158	0.179		0.0584	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Potassium-40	22.3		2.13	3.10		0.119	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Protactinium-231	0.824	U	2.57	2.57		2.79	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Radium-226	0.923		0.151	0.178	0.700	0.0144	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Radium-228	0.932		0.223	0.242		0.168	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thallium-208	0.345		0.0907	0.0973		0.0311	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thorium-228	0.874		0.127	0.157		0.0573	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thorium-232	0.932		0.223	0.242		0.168	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thorium-234	0.782		0.707	0.712		0.544	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Uranium-235	0.0291	U	0.0639	0.0640		0.406	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Uranium-238	0.782		0.707	0.712		0.544	pCi/g	09/18/18 10:19	10/09/18 14:18	1

Client Sample ID: PE2-RSYC9-DC-S004

Lab Sample ID: 160-30734-4

Date Collected: 09/06/18 12:53

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.931		0.194	0.216		0.0710	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Actinium-227	0.0960	U	0.408	0.408		0.317	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Bismuth-212	-0.0602	U	1.05	1.05		0.857	pCi/g	09/18/18 10:19	10/09/18 14:16	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S004

Lab Sample ID: 160-30734-4

Date Collected: 09/06/18 12:53

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.536		0.135	0.146		0.0461	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Cesium-137	-0.0518	U	0.0791	0.0793	0.0700	0.0701	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Cobalt-60	0.0643		0.0347	0.0353	0.200	0.0130	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Lead-210	0.833	U	1.48	1.48		1.01	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Lead-212	0.694		0.116	0.147		0.0548	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Lead-214	0.511		0.135	0.145		0.0553	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Potassium-40	14.9		1.86	2.41		0.258	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Protactinium-231	0.497	U	1.86	1.86		2.03	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Radium-226	0.536		0.135	0.146	0.700	0.0461	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Radium-228	0.931		0.194	0.216		0.0710	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Thallium-208	0.239		0.0682	0.0725		0.0240	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Thorium-228	0.694		0.116	0.147		0.0548	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Thorium-232	0.931		0.194	0.216		0.0710	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Thorium-234	0.248	U	0.518	0.519		0.494	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Uranium-235	0.104	U	0.391	0.391		0.318	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Uranium-238	0.248	U	0.518	0.519		0.494	pCi/g	09/18/18 10:19	10/09/18 14:16	1

Client Sample ID: PE2-RSYC9-DC-S005

Lab Sample ID: 160-30734-5

Date Collected: 09/06/18 13:00

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.661		0.176	0.189		0.0385	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Actinium-227	-0.0818	U	0.664	0.664		0.410	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Bismuth-212	1.52		0.666	0.684		0.213	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Bismuth-214	0.517		0.146	0.156		0.0522	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Cesium-137	0.0372	U	0.0838	0.0839	0.0700	0.0658	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Cobalt-60	0.0440		0.0621	0.0623	0.200	0.0366	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Lead-210	-0.150	U	1.61	1.61		1.33	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Lead-212	0.623		0.133	0.155		0.0745	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Lead-214	0.567		0.139	0.151		0.0658	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Potassium-40	14.0		1.95	2.42		0.158	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Protactinium-231	0.0000002	U	3.10	3.10		2.56	pCi/g	09/18/18 10:19	10/09/18 14:17	1
	24									
Radium-226	0.517		0.146	0.156	0.700	0.0522	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Radium-228	0.661		0.176	0.189		0.0385	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Thallium-208	0.318		0.0919	0.0976		0.0321	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Thorium-228	0.623		0.133	0.155		0.0745	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Thorium-232	0.661		0.176	0.189		0.0385	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Thorium-234	0.201	U	0.621	0.622		0.497	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Uranium-235	-0.250	U	0.746	0.746		0.609	pCi/g	09/18/18 10:19	10/09/18 14:17	1
Uranium-238	0.201	U	0.621	0.622		0.497	pCi/g	09/18/18 10:19	10/09/18 14:17	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S006

Lab Sample ID: 160-30734-6

Date Collected: 09/06/18 13:07

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.778		0.202	0.217		0.112	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Actinium-227	-0.204	U	1.23	1.23		0.424	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Bismuth-212	0.0123	U	0.853	0.853		0.701	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Bismuth-214	0.711		0.148	0.166		0.0636	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Cesium-137	-0.0399	U	0.0723	0.0724	0.0700	0.0567	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Cobalt-60	0.00180	U	0.00314	0.00314	0.200	0.0412	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Lead-210	0.512	U	1.28	1.28		0.921	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Lead-212	0.741		0.111	0.147		0.0500	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Lead-214	0.593		0.132	0.146		0.0561	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Potassium-40	17.3		1.78	2.51		0.268	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Protactinium-231	-0.570	U	2.81	2.81		2.30	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Radium-226	0.711		0.148	0.166	0.700	0.0636	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Radium-228	0.778		0.202	0.217		0.112	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thallium-208	0.216		0.0636	0.0674		0.0236	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thorium-228	0.741		0.111	0.147		0.0500	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thorium-232	0.778		0.202	0.217		0.112	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Thorium-234	0.644		0.615	0.619		0.525	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Uranium-235	0.114	U	0.279	0.279		0.371	pCi/g	09/18/18 10:19	10/09/18 14:18	1
Uranium-238	0.644		0.615	0.619		0.525	pCi/g	09/18/18 10:19	10/09/18 14:18	1

Client Sample ID: PE2-RSYC9-DC-S007

Lab Sample ID: 160-30734-7

Date Collected: 09/06/18 13:14

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.982		0.224	0.245		0.0347	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Actinium-227	0.0169	U	0.0415	0.0416		0.458	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Bismuth-212	0.371	U	1.06	1.06		0.841	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Bismuth-214	0.699		0.168	0.183		0.0597	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Cesium-137	0.00168	U	0.0729	0.0729	0.0700	0.0596	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Cobalt-60	-0.0618	U	0.131	0.132	0.200	0.0644	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Lead-210	-1.13	U	2.45	2.45		1.98	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Lead-212	0.678		0.112	0.142		0.0472	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Lead-214	0.741		0.127	0.149		0.0592	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Potassium-40	17.3		2.07	2.72		0.245	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Protactinium-231	0.000	U	0.689	0.689		2.76	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Radium-226	0.699		0.168	0.183	0.700	0.0597	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Radium-228	0.982		0.224	0.245		0.0347	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Thallium-208	0.248		0.0627	0.0678		0.0140	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Thorium-228	0.678		0.112	0.142		0.0472	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Thorium-232	0.982		0.224	0.245		0.0347	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Thorium-234	0.890		0.803	0.809		0.534	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Uranium-235	-0.301	U	0.362	0.363		0.588	pCi/g	09/18/18 10:19	10/09/18 14:54	1
Uranium-238	0.890		0.803	0.809		0.534	pCi/g	09/18/18 10:19	10/09/18 14:54	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S008

Lab Sample ID: 160-30734-8

Date Collected: 09/06/18 13:21

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.464		0.173	0.179		0.163	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Actinium-227	0.0215	U	0.560	0.560		0.333	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Bismuth-212	-0.0818	U	0.460	0.460		0.273	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Bismuth-214	0.607		0.154	0.166		0.0541	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Cesium-137	0.00232	U	0.0502	0.0502	0.0700	0.0411	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Cobalt-60	0.0236		0.0420	0.0421	0.200	0.0227	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Lead-210	-0.816	U	1.60	1.60		1.29	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Lead-212	0.496		0.0887	0.110		0.0415	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Lead-214	0.562		0.100	0.116		0.0442	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Potassium-40	10.2		1.33	1.70		0.246	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Protactinium-231	0.000	U	0.850	0.850		2.08	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Radium-226	0.607		0.154	0.166	0.700	0.0541	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Radium-228	0.464		0.173	0.179		0.163	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Thallium-208	0.158		0.0571	0.0595		0.0223	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Thorium-228	0.496		0.0887	0.110		0.0415	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Thorium-232	0.464		0.173	0.179		0.163	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Thorium-234	0.728		0.382	0.391		0.310	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Uranium-235	-0.169	U	0.499	0.499		0.406	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Uranium-238	0.728		0.382	0.391		0.310	pCi/g	09/18/18 10:19	10/09/18 14:53	1

Client Sample ID: PE2-RSYC9-DC-S009

Lab Sample ID: 160-30734-9

Date Collected: 09/06/18 13:28

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.789		0.225	0.239		0.178	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Actinium-227	0.222	U	0.468	0.468		0.401	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Bismuth-212	0.227	U	1.02	1.02		0.822	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Bismuth-214	0.708		0.174	0.189		0.0528	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Cesium-137	-0.0123	U	0.0959	0.0959	0.0700	0.0782	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Cobalt-60	-0.00536	U	0.104	0.104	0.200	0.0515	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Lead-210	-1.63	U	2.47	2.48		2.08	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Lead-212	0.824		0.123	0.150		0.0506	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Lead-214	0.675		0.171	0.184		0.0695	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Potassium-40	17.4		1.94	2.61		0.126	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Protactinium-231	-1.01	U	3.48	3.48		2.84	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Radium-226	0.708		0.174	0.189	0.700	0.0528	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Radium-228	0.789		0.225	0.239		0.178	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Thallium-208	0.329		0.0763	0.0833		0.0174	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Thorium-228	0.824		0.123	0.150		0.0506	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Thorium-232	0.789		0.225	0.239		0.178	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Thorium-234	0.809		0.639	0.645		0.479	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Uranium-235	0.187	U	0.453	0.453		0.576	pCi/g	09/18/18 10:19	10/09/18 14:53	1
Uranium-238	0.809		0.639	0.645		0.479	pCi/g	09/18/18 10:19	10/09/18 14:53	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S010

Lab Sample ID: 160-30734-10

Date Collected: 09/06/18 13:36

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.487		0.220	0.226		0.0758	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Actinium-227	-0.0109	U	0.0220	0.0221		0.390	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Bismuth-212	0.000	U	0.695	0.695		0.745	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Bismuth-214	0.559		0.149	0.160		0.0497	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Cesium-137	-0.0697	U	0.0827	0.0830	0.0700	0.0935	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Cobalt-60	0.0207	U	0.0362	0.0363	0.200	0.0336	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Lead-210	-0.274	U	1.48	1.48		1.06	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Lead-212	0.432		0.101	0.115		0.0529	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Lead-214	0.506		0.126	0.137		0.0719	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Potassium-40	13.3		1.83	2.28		0.275	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Protactinium-231	-0.766	U	2.73	2.73		2.22	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Radium-226	0.559		0.149	0.160	0.700	0.0497	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Radium-228	0.487		0.220	0.226		0.0758	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Thallium-208	0.242		0.0822	0.0860		0.0323	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Thorium-228	0.432		0.101	0.115		0.0529	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Thorium-232	0.487		0.220	0.226		0.0758	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Thorium-234	1.06		0.634	0.644		0.386	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Uranium-235	0.103	U	0.284	0.284		0.304	pCi/g	09/18/18 10:19	10/09/18 16:13	1
Uranium-238	1.06		0.634	0.644		0.386	pCi/g	09/18/18 10:19	10/09/18 16:13	1

Client Sample ID: PE2-RSYC9-DC-S011

Lab Sample ID: 160-30734-11

Date Collected: 09/06/18 13:43

Matrix: Solid

Date Received: 09/14/18 08:45

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Total Beta Strontium	0.0103	U	0.0576	0.0576	0.331	0.0464	pCi/g	09/18/18 18:36	10/08/18 04:45	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	86.4		40 - 110					09/18/18 18:36	10/08/18 04:45	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.457		0.309	0.312		0.162	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Actinium-227	0.214	U	0.500	0.501		0.413	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Bismuth-212	-0.0124	U	1.15	1.15		0.143	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Bismuth-214	0.560		0.161	0.171		0.0578	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Cesium-137	0.0239	U	0.0498	0.0498	0.0700	0.0371	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Cobalt-60	-0.00234	U	0.00769	0.00769	0.200	0.0558	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Lead-210	-0.472	U	1.94	1.94		1.61	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Lead-212	0.378		0.123	0.133		0.0777	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Lead-214	0.533		0.187	0.195		0.120	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Potassium-40	10.5		2.41	2.64		0.821	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Protactinium-231	-1.35	U	4.77	4.77		3.90	pCi/g	09/18/18 10:19	10/09/18 14:56	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S011

Lab Sample ID: 160-30734-11

Date Collected: 09/06/18 13:43

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium-226	0.560		0.161	0.171	0.700	0.0578	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Radium-228	0.457		0.309	0.312		0.162	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Thallium-208	0.228		0.0680	0.0720		0.0184	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Thorium-228	0.378		0.123	0.133		0.0777	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Thorium-232	0.457		0.309	0.312		0.162	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Thorium-234	-0.103	U	1.48	1.48		1.22	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Uranium-235	0.138	U	0.438	0.438		0.484	pCi/g	09/18/18 10:19	10/09/18 14:56	1
Uranium-238	-0.103	U	1.48	1.48		1.22	pCi/g	09/18/18 10:19	10/09/18 14:56	1

Client Sample ID: PE2-RSYC9-DC-S012

Lab Sample ID: 160-30734-12

Date Collected: 09/06/18 13:49

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.983		0.203	0.226		0.0768	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Actinium-227	-0.0306	U	0.542	0.542		0.368	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Bismuth-212	0.272	U	0.493	0.494		0.368	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Bismuth-214	0.752		0.159	0.177		0.0609	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Cesium-137	0.0264	U	0.0541	0.0542	0.0700	0.0419	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Cobalt-60	-0.00393	U	0.0179	0.0179	0.200	0.0514	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Lead-210	1.80		1.64	1.65		1.06	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Lead-212	0.848		0.121	0.163		0.0515	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Lead-214	0.812		0.154	0.176		0.0683	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Potassium-40	18.0		1.89	2.64		0.289	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Protactinium-231	-0.829	U	2.90	2.90		2.36	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Radium-226	0.752		0.159	0.177	0.700	0.0609	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Radium-228	0.983		0.203	0.226		0.0768	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Thallium-208	0.325		0.0849	0.0913		0.0321	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Thorium-228	0.848		0.121	0.163		0.0515	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Thorium-232	0.983		0.203	0.226		0.0768	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Thorium-234	0.391	U	0.531	0.533		0.533	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Uranium-235	0.108	U	0.101	0.102		0.355	pCi/g	09/18/18 10:19	10/09/18 14:58	1
Uranium-238	0.391	U	0.531	0.533		0.533	pCi/g	09/18/18 10:19	10/09/18 14:58	1

Client Sample ID: PE2-RSYC9-DC-S013

Lab Sample ID: 160-30734-13

Date Collected: 09/06/18 14:00

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.665		0.279	0.287		0.0977	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Actinium-227	0.0864	U	0.302	0.302		0.569	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Bismuth-212	1.38		0.713	0.727		0.365	pCi/g	09/18/18 10:19	10/09/18 15:31	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S013

Lab Sample ID: 160-30734-13

Date Collected: 09/06/18 14:00

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.629		0.190	0.200		0.0750	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Cesium-137	-0.00141	U	0.111	0.111	0.0700	0.0867	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Cobalt-60	0.0741		0.0447	0.0453	0.200	0.0157	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Lead-210	2.88		2.39	2.41		1.42	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Lead-212	0.751		0.147	0.166		0.0777	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Lead-214	0.913		0.209	0.228		0.0792	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Potassium-40	15.4		2.12	2.63		0.429	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Protactinium-231	0.369	U	2.23	2.23		3.45	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Radium-226	0.629		0.190	0.200	0.700	0.0750	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Radium-228	0.665		0.279	0.287		0.0977	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Thallium-208	0.358		0.0898	0.0969		0.0208	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Thorium-228	0.751		0.147	0.166		0.0777	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Thorium-232	0.665		0.279	0.287		0.0977	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Thorium-234	-1.21	U	1.24	1.25		1.54	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Uranium-235	-0.304	U	0.507	0.508		0.823	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Uranium-238	-1.21	U	1.24	1.25		1.54	pCi/g	09/18/18 10:19	10/09/18 15:31	1

Client Sample ID: PE2-RSYC9-DC-S014

Lab Sample ID: 160-30734-14

Date Collected: 09/06/18 13:54

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.426		0.162	0.168		0.0587	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Actinium-227	0.257	U	0.539	0.540		0.340	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Bismuth-212	-0.450	U	0.965	0.966		0.762	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Bismuth-214	0.343		0.138	0.143		0.0649	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Cesium-137	0.0319	U	0.0647	0.0648	0.0700	0.0504	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Cobalt-60	0.0359		0.0448	0.0450	0.200	0.0269	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Lead-210	0.878		1.16	1.16		0.822	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Lead-212	0.448		0.0991	0.115		0.0516	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Lead-214	0.433		0.112	0.120		0.0514	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Potassium-40	11.5		1.57	1.96		0.302	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Protactinium-231	-0.957	U	3.09	3.09		2.51	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Radium-226	0.343		0.138	0.143	0.700	0.0649	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Radium-228	0.426		0.162	0.168		0.0587	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Thallium-208	0.217		0.0658	0.0696		0.0232	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Thorium-228	0.448		0.0991	0.115		0.0516	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Thorium-232	0.426		0.162	0.168		0.0587	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Thorium-234	0.767		0.624	0.630		0.462	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Uranium-235	0.101	U	0.225	0.225		0.299	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Uranium-238	0.767		0.624	0.630		0.462	pCi/g	09/18/18 10:19	10/09/18 15:32	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S015

Lab Sample ID: 160-30734-15

Date Collected: 09/06/18 14:06

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.968		0.250	0.269		0.0376	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Actinium-227	0.173	U	0.333	0.334		0.466	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Bismuth-212	-0.355	U	1.17	1.17		0.900	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Bismuth-214	0.585		0.164	0.175		0.0612	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Cesium-137	-0.0353	U	0.119	0.119	0.0700	0.0963	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Cobalt-60	0.0718		0.0307	0.0316	0.200	0.0612	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Lead-210	-0.978	U	1.16	1.16		1.78	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Lead-212	0.642		0.131	0.155		0.0722	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Lead-214	0.663		0.160	0.174		0.0934	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Potassium-40	15.2		2.01	2.54		0.154	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Protactinium-231	0.000	U	0.530	0.530		2.75	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Radium-226	0.585		0.164	0.175	0.700	0.0612	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Radium-228	0.968		0.250	0.269		0.0376	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Thallium-208	0.182		0.116	0.118		0.0548	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Thorium-228	0.642		0.131	0.155		0.0722	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Thorium-232	0.968		0.250	0.269		0.0376	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Thorium-234	-0.0170	U	0.990	0.990		0.633	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Uranium-235	0.210	U	0.463	0.464		0.374	pCi/g	09/18/18 10:19	10/09/18 15:30	1
Uranium-238	-0.0170	U	0.990	0.990		0.633	pCi/g	09/18/18 10:19	10/09/18 15:30	1

Client Sample ID: PE2-RSYC9-DC-S016

Lab Sample ID: 160-30734-16

Date Collected: 09/06/18 14:12

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.03		0.274	0.294		0.0696	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Actinium-227	0.157	U	0.600	0.600		0.408	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Bismuth-212	0.000	U	0.704	0.704		0.759	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Bismuth-214	0.954		0.178	0.202		0.0489	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Cesium-137	-0.0217	U	0.0806	0.0806	0.0700	0.0649	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Cobalt-60	-0.0524	U	0.0974	0.0975	0.200	0.0457	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Lead-210	1.69		1.54	1.55		1.04	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Lead-212	0.881		0.123	0.154		0.0543	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Lead-214	0.908		0.159	0.183		0.0543	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Potassium-40	19.9		1.95	2.80		0.112	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Protactinium-231	0.786	U	2.45	2.45		2.68	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Radium-226	0.954		0.178	0.202	0.700	0.0489	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Radium-228	1.03		0.274	0.294		0.0696	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Thallium-208	0.410		0.0844	0.0942		0.0243	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Thorium-228	0.881		0.123	0.154		0.0543	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Thorium-232	1.03		0.274	0.294		0.0696	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Thorium-234	-0.129	U	1.19	1.19		0.979	pCi/g	09/18/18 10:19	10/09/18 15:32	1
Uranium-235	0.0000000	U	0.745	0.745		0.614	pCi/g	09/18/18 10:19	10/09/18 15:32	1
	704									
Uranium-238	-0.129	U	1.19	1.19		0.979	pCi/g	09/18/18 10:19	10/09/18 15:32	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Client Sample ID: PE2-RSYC9-DC-S017

Lab Sample ID: 160-30734-17

Date Collected: 09/06/18 14:18

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.868		0.203	0.221		0.0539	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Actinium-227	0.238	U	0.363	0.365		0.297	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Bismuth-212	1.24		0.475	0.492		0.171	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Bismuth-214	0.577		0.136	0.148		0.0498	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Cesium-137	-0.0423	U	0.0649	0.0650	0.0700	0.0507	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Cobalt-60	0.0398		0.0479	0.0481	0.200	0.0286	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Lead-210	0.697	U	1.54	1.54		1.24	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Lead-212	0.749		0.101	0.140		0.0455	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Lead-214	0.729		0.105	0.130		0.0437	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Potassium-40	16.5		1.58	2.31		0.219	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Protactinium-231	0.000	U	0.474	0.474		2.18	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Radium-226	0.577		0.136	0.148	0.700	0.0498	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Radium-228	0.868		0.203	0.221		0.0539	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Thallium-208	0.246		0.0757	0.0799		0.0300	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Thorium-228	0.749		0.101	0.140		0.0455	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Thorium-232	0.868		0.203	0.221		0.0539	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Thorium-234	-0.424	U	0.573	0.575		1.15	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Uranium-235	-0.197	U	0.552	0.552		0.451	pCi/g	09/18/18 10:19	10/09/18 15:29	1
Uranium-238	-0.424	U	0.573	0.575		1.15	pCi/g	09/18/18 10:19	10/09/18 15:29	1

Client Sample ID: PE2-RSYC9-DC-S018

Lab Sample ID: 160-30734-18

Date Collected: 09/06/18 14:25

Matrix: Solid

Date Received: 09/14/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.624		0.192	0.203		0.0357	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Actinium-227	-0.432	U	0.853	0.855		0.494	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Bismuth-212	0.254	U	0.702	0.702		0.548	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Bismuth-214	0.219		0.122	0.124		0.134	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Cesium-137	-0.0833	U	0.120	0.120	0.0700	0.0735	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Cobalt-60	0.00205	U	0.0916	0.0916	0.200	0.0468	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Lead-210	-0.913	U	1.99	1.99		1.60	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Lead-212	0.485		0.102	0.120		0.0501	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Lead-214	0.534		0.108	0.121		0.0498	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Potassium-40	11.1		1.69	2.04		0.252	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Protactinium-231	-1.08	U	3.39	3.40		2.76	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Radium-226	0.219		0.122	0.124	0.700	0.134	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Radium-228	0.624		0.192	0.203		0.0357	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Thallium-208	0.118		0.105	0.105		0.0486	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Thorium-228	0.485		0.102	0.120		0.0501	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Thorium-232	0.624		0.192	0.203		0.0357	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Thorium-234	0.251	U	0.414	0.415		0.510	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Uranium-235	-0.274	U	0.341	0.342		0.530	pCi/g	09/18/18 10:19	10/09/18 15:31	1
Uranium-238	0.251	U	0.414	0.415		0.510	pCi/g	09/18/18 10:19	10/09/18 15:31	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-390125/10-A
 Matrix: Solid
 Analysis Batch: 393579

Client Sample ID: Method Blank
 Prep Type: Total/NA
 Prep Batch: 390125

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.1158		0.0866	0.0869	0.331	0.0620	pCi/g	09/18/18 18:36	10/08/18 04:52	1
Carrier	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	68.7		40 - 110					09/18/18 18:36	10/08/18 04:52	1

Lab Sample ID: LCS 160-390125/1-A
 Matrix: Solid
 Analysis Batch: 393580

Client Sample ID: Lab Control Sample
 Prep Type: Total/NA
 Prep Batch: 390125

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	8.18	7.554		0.618	0.331	0.0517	pCi/g	92	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Sr Carrier	84.3		40 - 110						

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-389974/1-A
 Matrix: Solid
 Analysis Batch: 393783

Client Sample ID: Method Blank
 Prep Type: Total/NA
 Prep Batch: 389974

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.1023		0.0989	0.0994		0.0546	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Actinium-227	0.05465	U	0.148	0.148		0.303	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Bismuth-212	0.1665	U	1.29	1.29		1.04	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Bismuth-214	0.007636	U	0.181	0.181		0.147	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Cesium-137	-0.0003676	U	0.0702	0.0702	0.0700	0.0575	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Cobalt-60	0.06860		0.0553	0.0557	0.200	0.0218	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Lead-210	0.2963	U	1.35	1.35		0.957	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Lead-212	0.01144	U	0.104	0.104		0.0846	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Lead-214	0.006763	U	0.0335	0.0335		0.0658	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Potassium-40	-0.2896	U	0.739	0.740		0.386	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Protactinium-231	0.0000	U	0.704	0.704		1.71	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Radium-226	0.007636	U	0.181	0.181	0.700	0.147	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Radium-228	0.1023		0.0989	0.0994		0.0546	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Thallium-208	0.01826	U	0.0510	0.0510		0.0294	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Thorium-228	0.01144	U	0.104	0.104		0.0846	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Thorium-232	0.1023		0.0989	0.0994		0.0546	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Thorium-234	-0.5099	U	0.638	0.641		0.656	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Uranium-235	0.04279	U	0.203	0.203		0.191	pCi/g	09/18/18 10:19	10/09/18 14:16	1
Uranium-238	-0.5099	U	0.638	0.641		0.656	pCi/g	09/18/18 10:19	10/09/18 14:16	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-389974/2-A
Matrix: Solid
Analysis Batch: 393783

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 389974

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec Limits
Americium-241	96.8	99.72		10.5		0.631	pCi/g	103	87 - 116
Cesium-137	28.1	27.65		2.98	0.0700	0.116	pCi/g	98	87 - 120
Cobalt-60	12.6	12.12		1.37	0.200	0.0652	pCi/g	96	87 - 115

Lab Sample ID: 160-30734-1 DU
Matrix: Solid
Analysis Batch: 393777

Client Sample ID: PE2-RSYC9-DC-S001
Prep Type: Total/NA
Prep Batch: 389974

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.768		0.7550		0.202		0.0266	pCi/g	0.03	1
Actinium-227	0.307	U	-0.3726	U	1.13		0.404	pCi/g	0.36	1
Bismuth-212	-0.500	U	1.213		0.652		0.273	pCi/g	0.95	1
Bismuth-214	0.637		0.6565		0.151		0.0402	pCi/g	0.06	1
Cesium-137	0.0101	U	-0.00506	U	0.0742	0.0700	0.0405	pCi/g	0.10	1
Cobalt-60	0.0453		0.005955	U	0.0509	0.200	0.0248	pCi/g	0.30	1
Lead-210	0.385	U	0.5709	U	1.54		1.24	pCi/g	0.05	1
Lead-212	0.628		0.7189		0.143		0.0479	pCi/g	0.31	1
Lead-214	0.869		0.7414		0.142		0.0535	pCi/g	0.40	1
Potassium-40	13.7		13.01		2.06		0.268	pCi/g	0.15	1
Protactinium-231	0.000	U	-1.011	U	3.17		2.58	pCi/g	0.25	1
Radium-226	0.637		0.6565		0.151	0.700	0.0402	pCi/g	0.06	1
Radium-228	0.768		0.7550		0.202		0.0266	pCi/g	0.03	1
Thallium-208	0.259		0.3084		0.0818		0.0230	pCi/g	0.28	1
Thorium-228	0.628		0.7189		0.143		0.0479	pCi/g	0.31	1
Thorium-232	0.768		0.7550		0.202		0.0266	pCi/g	0.03	1
Thorium-234	0.129	U	0.2682	U	0.562		1.08	pCi/g	0.10	1
Uranium-235	-0.302	U	-0.2036	U	0.598		0.487	pCi/g	0.1	1
Uranium-238	0.129	U	0.2682	U	0.562		1.08	pCi/g	0.10	1

QC Association Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Rad

Leach Batch: 389254

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-30734-1	PE2-RSYC9-DC-S001	Total/NA	Solid	Dry and Grind	
160-30734-2	PE2-RSYC9-DC-S002	Total/NA	Solid	Dry and Grind	
160-30734-3	PE2-RSYC9-DC-S003	Total/NA	Solid	Dry and Grind	
160-30734-4	PE2-RSYC9-DC-S004	Total/NA	Solid	Dry and Grind	
160-30734-5	PE2-RSYC9-DC-S005	Total/NA	Solid	Dry and Grind	
160-30734-6	PE2-RSYC9-DC-S006	Total/NA	Solid	Dry and Grind	
160-30734-7	PE2-RSYC9-DC-S007	Total/NA	Solid	Dry and Grind	
160-30734-8	PE2-RSYC9-DC-S008	Total/NA	Solid	Dry and Grind	
160-30734-9	PE2-RSYC9-DC-S009	Total/NA	Solid	Dry and Grind	
160-30734-10	PE2-RSYC9-DC-S010	Total/NA	Solid	Dry and Grind	
160-30734-11	PE2-RSYC9-DC-S011	Total/NA	Solid	Dry and Grind	
160-30734-12	PE2-RSYC9-DC-S012	Total/NA	Solid	Dry and Grind	
160-30734-13	PE2-RSYC9-DC-S013	Total/NA	Solid	Dry and Grind	
160-30734-14	PE2-RSYC9-DC-S014	Total/NA	Solid	Dry and Grind	
160-30734-15	PE2-RSYC9-DC-S015	Total/NA	Solid	Dry and Grind	
160-30734-16	PE2-RSYC9-DC-S016	Total/NA	Solid	Dry and Grind	
160-30734-17	PE2-RSYC9-DC-S017	Total/NA	Solid	Dry and Grind	
160-30734-18	PE2-RSYC9-DC-S018	Total/NA	Solid	Dry and Grind	
160-30734-1 DU	PE2-RSYC9-DC-S001	Total/NA	Solid	Dry and Grind	

Prep Batch: 389974

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-30734-1	PE2-RSYC9-DC-S001	Total/NA	Solid	Fill_Geo-21	389254
160-30734-2	PE2-RSYC9-DC-S002	Total/NA	Solid	Fill_Geo-21	389254
160-30734-3	PE2-RSYC9-DC-S003	Total/NA	Solid	Fill_Geo-21	389254
160-30734-4	PE2-RSYC9-DC-S004	Total/NA	Solid	Fill_Geo-21	389254
160-30734-5	PE2-RSYC9-DC-S005	Total/NA	Solid	Fill_Geo-21	389254
160-30734-6	PE2-RSYC9-DC-S006	Total/NA	Solid	Fill_Geo-21	389254
160-30734-7	PE2-RSYC9-DC-S007	Total/NA	Solid	Fill_Geo-21	389254
160-30734-8	PE2-RSYC9-DC-S008	Total/NA	Solid	Fill_Geo-21	389254
160-30734-9	PE2-RSYC9-DC-S009	Total/NA	Solid	Fill_Geo-21	389254
160-30734-10	PE2-RSYC9-DC-S010	Total/NA	Solid	Fill_Geo-21	389254
160-30734-11	PE2-RSYC9-DC-S011	Total/NA	Solid	Fill_Geo-21	389254
160-30734-12	PE2-RSYC9-DC-S012	Total/NA	Solid	Fill_Geo-21	389254
160-30734-13	PE2-RSYC9-DC-S013	Total/NA	Solid	Fill_Geo-21	389254
160-30734-14	PE2-RSYC9-DC-S014	Total/NA	Solid	Fill_Geo-21	389254
160-30734-15	PE2-RSYC9-DC-S015	Total/NA	Solid	Fill_Geo-21	389254
160-30734-16	PE2-RSYC9-DC-S016	Total/NA	Solid	Fill_Geo-21	389254
160-30734-17	PE2-RSYC9-DC-S017	Total/NA	Solid	Fill_Geo-21	389254
160-30734-18	PE2-RSYC9-DC-S018	Total/NA	Solid	Fill_Geo-21	389254
MB 160-389974/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-389974/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-30734-1 DU	PE2-RSYC9-DC-S001	Total/NA	Solid	Fill_Geo-21	389254

Prep Batch: 390125

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-30734-1	PE2-RSYC9-DC-S001	Total/NA	Solid	DPS-0	389254
160-30734-11	PE2-RSYC9-DC-S011	Total/NA	Solid	DPS-0	389254
MB 160-390125/10-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-390125/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-30734-2

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Sr Carrier (40-110)	Percent Yield (Acceptance Limits)
160-30734-1	PE2-RSYC9-DC-S001	83.8	
160-30734-11	PE2-RSYC9-DC-S011	86.4	
LCS 160-390125/1-A	Lab Control Sample	84.3	
MB 160-390125/10-A	Method Blank	68.7	

Tracer/Carrier Legend

Sr Carrier = Sr Carrier

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

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TestAmerica Job ID: 160-31046-2

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

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Attn: Eddie Kalombo

Micha Korrinhizer

Authorized for release by:

10/29/2018 3:37:15 PM

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1

2

3

4

5

6

7

8

9

10

11

12



Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	6
Definitions/Glossary	7
Method Summary	8
Sample Summary	9
Client Sample Results	10
QC Sample Results	14
QC Association Summary	16
Tracer Carrier Summary	17

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Job ID: 160-31046-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-31046-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup
Method 3665A: Sulfuric Acid/Permanganate Cleanup

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Job ID: 160-31046-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 10/02/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0° C.

TOTAL BETA STRONTIUM (GFPC)

Sample PE2-RSYC9-DC-B-S001 (160-31046-1) was analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 10/02/2018, prepared on 10/07/2018 and analyzed on 10/25/2018.

The following sample in batch 160-393536 could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYC9-DC-B-S001 (160-31046-1). The sample contained detritus material and rocks of varying sizes.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYC9-DC-B-S001 (160-31046-1), PE2-RSYC9-DC-B-S002 (160-31046-2), PE2-RSYC9-DC-B-S003 (160-31046-3), PE2-RSYC9-DC-B-S004 (160-31046-4), PE2-RSYC9-DC-B-S005 (160-31046-5) and PE2-RSYC9-DC-B-S006 (160-31046-6) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 10/02/2018, prepared on 10/03/2018 and analyzed on 10/25/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met for sample PE2-RSYC9-DC-B-S003 (160-31046-3) in batch 160-392879. This is caused by statistical fluctuations in the Compton background due to low level activity in the sample in conjunction with the software attempting to fit a peak into the noise of this baseline.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

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Project Number: **500506**
CTO-013 RSYC9 Deconstruction biased sample

Project Name: **HPNS - Parcel E-2**
Project Location: **HPNS - Parcel E-2**
Purchase Order #: **202296**

Shipment/Pickup Date: **10.1.18**
Waybill Number: **126645451345417137**
Lab Destination: **TestAmerica (St. Louis Lab)**
13715 Rider Trail North
Earth City, MO 63045

Lab Contact Name / ph. #: **Rhonda Ridenhower (314) 298-8566**

Project Manager: **Nels Johnson**
(Name & phone #)

Send Report To: **Eddie Kalombo**
Phone/Fax Number: **415-987-0760**
Address: **4005 Port Chicago Hwy**
Concord, CA, 94520

Sampler's Name(s): **JOHANN RAMIREZ**

Sample ID Number	Sample Description	Date	Time	Method	Matrix	# of containers	Preservative (water)	Preservative (soil)	Container Type
PE2-RSYC9-DC-B-S001	Parcel E-2 RSYC9 Biased	9/20/18	1406	G	SO	1	16 oz. plastic jar		
PE2-RSYC9-DC-B-S002	Parcel E-2 RSYC9 Biased	9/20/18	1412	G	SO	1	16 oz. plastic jar		
PE2-RSYC9-DC-B-S003	Parcel E-2 RSYC9 Biased	9/20/18	1418	G	SO	1	16 oz. plastic jar		
PE2-RSYC9-DC-B-S004	Parcel E-2 RSYC9 Biased	9/20/18	1424	G	SO	1	16 oz. plastic jar		
PE2-RSYC9-DC-B-S005	Parcel E-2 RSYC9 Biased	9/20/18	1430	G	SO	1	16 oz. plastic jar		
PE2-RSYC9-DC-B-S006	Parcel E-2 RSYC9 Biased	9/20/18	1436	G	SO	1	16 oz. plastic jar		

Analyses Requested	Gamma Spec (EPA 191.1M) - (7 day in-growth preliminary results and full 21 day in-growth for full gamma results)	Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)	Dose Rate μ R/hr
	N/A	N/A	N/A	
	X	X	X	5
	X			5
	X			5
	X			5
	X			5



160-31046 Chain of Custody

Special Instructions:

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g. 7 days ingrown draft and follow with 21 days final.

Level of QC Required: 24-hr 3-day 10-day

Standard TAT - 10-day

Relinquished By: **JOHANN RAMIREZ** Date: **10.1.18** Time: **1600**

Relinquished By: **Eddie Kalombo** Date: **10.1.18** Time: **1600**

Relinquished By: _____ Date: _____ Time: _____

Relinquished By: _____ Date: _____ Time: _____

Received By: **Eddie Kalombo** Date: **10.1.18** Time: **1600**

Received By: **Eddie Kalombo** Date: **10.2.18** Time: **0830**

Received By: _____ Date: _____ Time: _____

Received By: _____ Date: _____ Time: _____

Method Codes: C = Composite G = Grab

Matrix Codes: SO = Soil DW = Drinking Water SL = Sludge GW = Ground Water WW = Waste Water CP = Chip Samples A = Air ABS=Asbestos, PO=Pipe Opening

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-31046-2

Login Number: 31046**List Source: TestAmerica St. Louis****List Number: 1****Creator: Press, Nicholas B**

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy
 None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

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Sample Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-31046-1	PE2-RSYC9-DC-B-S001	Solid	09/20/18 14:06	10/02/18 08:40
160-31046-2	PE2-RSYC9-DC-B-S002	Solid	09/20/18 14:12	10/02/18 08:40
160-31046-3	PE2-RSYC9-DC-B-S003	Solid	09/20/18 14:18	10/02/18 08:40
160-31046-4	PE2-RSYC9-DC-B-S004	Solid	09/20/18 14:24	10/02/18 08:40
160-31046-5	PE2-RSYC9-DC-B-S005	Solid	09/20/18 14:30	10/02/18 08:40
160-31046-6	PE2-RSYC9-DC-B-S006	Solid	09/20/18 14:36	10/02/18 08:40

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Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Client Sample ID: PE2-RSYC9-DC-B-S001

Lab Sample ID: 160-31046-1

Date Collected: 09/20/18 14:06

Matrix: Solid

Date Received: 10/02/18 08:40

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0341	U	0.0672	0.0672	0.331	0.0524	pCi/g	10/07/18 13:14	10/25/18 05:44	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	84.8		40 - 110					10/07/18 13:14	10/25/18 05:44	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.05		0.223	0.247		0.0277	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Actinium-227	0.173	U	0.406	0.407		0.469	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Bismuth-212	1.55		0.491	0.516		0.0905	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Bismuth-214	0.840		0.180	0.199		0.0629	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Cesium-137	-0.0514	U	0.0833	0.0835	0.0700	0.0653	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Cobalt-60	-0.0153	U	0.0742	0.0743	0.200	0.0359	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Lead-210	-1.15	U	2.46	2.46		2.06	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Lead-212	0.774		0.119	0.144		0.0586	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Lead-214	0.738		0.137	0.156		0.0645	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Potassium-40	19.9		2.02	2.85		0.271	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Protactinium-231	0.526	U	3.32	3.32		2.72	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Radium-226	0.840		0.180	0.199	0.700	0.0629	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Radium-228	1.05		0.223	0.247		0.0277	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Thallium-208	0.300		0.0721	0.0783		0.0241	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Thorium-228	0.774		0.119	0.144		0.0586	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Thorium-232	1.05		0.223	0.247		0.0277	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Thorium-234	-0.548	U	0.805	0.807		1.08	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Uranium-235	0.0917	U	0.192	0.192		0.534	pCi/g	10/03/18 12:58	10/25/18 12:33	1
Uranium-238	-0.548	U	0.805	0.807		1.08	pCi/g	10/03/18 12:58	10/25/18 12:33	1

Client Sample ID: PE2-RSYC9-DC-B-S002

Lab Sample ID: 160-31046-2

Date Collected: 09/20/18 14:12

Matrix: Solid

Date Received: 10/02/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.764		0.158	0.176		0.0865	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Actinium-227	-0.00275	U	0.00804	0.00804		0.334	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Bismuth-212	1.37		0.565	0.582		0.198	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Bismuth-214	0.555		0.126	0.139		0.0709	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Cesium-137	-0.0398	U	0.0644	0.0646	0.0700	0.0508	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Cobalt-60	0.0159	U	0.0322	0.0323	0.200	0.0313	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Lead-210	-0.377	U	1.47	1.47		1.07	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Lead-212	0.682		0.0873	0.124		0.0355	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Lead-214	0.718		0.117	0.139		0.0382	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Potassium-40	17.5		1.54	2.37		0.225	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Protactinium-231	-0.753	U	2.51	2.51		2.05	pCi/g	10/03/18 12:58	10/25/18 13:12	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Client Sample ID: PE2-RSYC9-DC-B-S002

Lab Sample ID: 160-31046-2

Date Collected: 09/20/18 14:12

Matrix: Solid

Date Received: 10/02/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium-226	0.555		0.126	0.139	0.700	0.0709	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Radium-228	0.764		0.158	0.176		0.0865	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Thallium-208	0.329		0.0679	0.0760		0.0215	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Thorium-228	0.682		0.0873	0.124		0.0355	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Thorium-232	0.764		0.158	0.176		0.0865	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Thorium-234	-0.423	U	0.559	0.561		1.15	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Uranium-235	-0.0407	U	0.0699	0.0700		0.455	pCi/g	10/03/18 12:58	10/25/18 13:12	1
Uranium-238	-0.423	U	0.559	0.561		1.15	pCi/g	10/03/18 12:58	10/25/18 13:12	1

Client Sample ID: PE2-RSYC9-DC-B-S003

Lab Sample ID: 160-31046-3

Date Collected: 09/20/18 14:18

Matrix: Solid

Date Received: 10/02/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.795		0.221	0.236		0.0613	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Actinium-227	0.139	U	0.305	0.306		0.388	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Bismuth-212	-0.284	U	1.03	1.04		0.830	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Bismuth-214	0.612		0.182	0.193		0.0788	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Cesium-137	0.0314	U	0.0948	0.0948	0.0700	0.0757	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Cobalt-60	0.0896		0.0471	0.0480	0.200	0.0141	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Lead-210	1.55		1.24	1.25		0.788	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Lead-212	0.810		0.122	0.161		0.0534	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Lead-214	0.786		0.156	0.176		0.0584	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Potassium-40	15.3		2.05	2.58		0.378	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Protactinium-231	-0.982	U	3.34	3.34		2.72	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Radium-226	0.612		0.182	0.193	0.700	0.0788	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Radium-228	0.795		0.221	0.236		0.0613	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Thallium-208	0.333		0.0797	0.0868		0.0230	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Thorium-228	0.810		0.122	0.161		0.0534	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Thorium-232	0.795		0.221	0.236		0.0613	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Thorium-234	0.218	U	0.625	0.625		0.503	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Uranium-235	-0.159	U	0.334	0.335		0.332	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Uranium-238	0.218	U	0.625	0.625		0.503	pCi/g	10/03/18 12:58	10/25/18 13:47	1

Client Sample ID: PE2-RSYC9-DC-B-S004

Lab Sample ID: 160-31046-4

Date Collected: 09/20/18 14:24

Matrix: Solid

Date Received: 10/02/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.844		0.208	0.225		0.0302	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Actinium-227	0.449		0.495	0.498		0.368	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Bismuth-212	0.452	U	0.824	0.825		0.640	pCi/g	10/03/18 12:58	10/25/18 13:44	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Client Sample ID: PE2-RSYC9-DC-B-S004

Lab Sample ID: 160-31046-4

Date Collected: 09/20/18 14:24

Matrix: Solid

Date Received: 10/02/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.641		0.156	0.169		0.0515	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Cesium-137	0.0255	U	0.0830	0.0831	0.0700	0.0665	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Cobalt-60	0.0200	U	0.0270	0.0270	0.200	0.0442	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Lead-210	-0.673	U	1.05	1.06		1.69	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Lead-212	0.726		0.115	0.149		0.0566	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Lead-214	0.775		0.128	0.152		0.0536	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Potassium-40	17.0		1.91	2.58		0.228	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Protactinium-231	0.000	U	0.750	0.750		2.54	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Radium-226	0.641		0.156	0.169	0.700	0.0515	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Radium-228	0.844		0.208	0.225		0.0302	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Thallium-208	0.256		0.0654	0.0706		0.0220	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Thorium-228	0.726		0.115	0.149		0.0566	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Thorium-232	0.844		0.208	0.225		0.0302	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Thorium-234	0.722		0.573	0.578		0.499	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Uranium-235	0.0845	U	0.135	0.135		0.491	pCi/g	10/03/18 12:58	10/25/18 13:44	1
Uranium-238	0.722		0.573	0.578		0.499	pCi/g	10/03/18 12:58	10/25/18 13:44	1

Client Sample ID: PE2-RSYC9-DC-B-S005

Lab Sample ID: 160-31046-5

Date Collected: 09/20/18 14:30

Matrix: Solid

Date Received: 10/02/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.795		0.144	0.165		0.0511	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Actinium-227	-0.102	U	0.206	0.206		0.330	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Bismuth-212	0.398	U	0.656	0.658		0.513	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Bismuth-214	0.553		0.113	0.127		0.0393	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Cesium-137	-0.0290	U	0.0544	0.0545	0.0700	0.0428	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Cobalt-60	-0.0615	U	0.0937	0.0939	0.200	0.0481	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Lead-210	-0.783	U	0.635	0.641		0.992	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Lead-212	0.731		0.0908	0.131		0.0370	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Lead-214	0.706		0.112	0.134		0.0518	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Potassium-40	16.4		1.50	2.25		0.227	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Protactinium-231	-0.189	U	2.51	2.51		2.06	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Radium-226	0.553		0.113	0.127	0.700	0.0393	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Radium-228	0.795		0.144	0.165		0.0511	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Thallium-208	0.258		0.0655	0.0707		0.0253	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Thorium-228	0.731		0.0908	0.131		0.0370	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Thorium-232	0.795		0.144	0.165		0.0511	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Thorium-234	-0.358	U	0.243	0.247		0.984	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Uranium-235	0.0209	U	0.244	0.244		0.412	pCi/g	10/03/18 12:58	10/25/18 13:47	1
Uranium-238	-0.358	U	0.243	0.247		0.984	pCi/g	10/03/18 12:58	10/25/18 13:47	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Client Sample ID: PE2-RSYC9-DC-B-S006

Lab Sample ID: 160-31046-6

Date Collected: 09/20/18 14:36

Matrix: Solid

Date Received: 10/02/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.768		0.196	0.211		0.0612	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Actinium-227	0.0763	U	0.305	0.305		0.358	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Bismuth-212	0.450	U	0.704	0.705		0.548	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Bismuth-214	0.564		0.122	0.136		0.0448	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Cesium-137	0.00238	U	0.0625	0.0625	0.0700	0.0514	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Cobalt-60	-0.0230	U	0.0976	0.0976	0.200	0.0442	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Lead-210	-0.390	U	0.749	0.751		1.15	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Lead-212	0.769		0.0981	0.140		0.0414	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Lead-214	0.783		0.133	0.156		0.0437	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Potassium-40	17.8		1.63	2.44		0.247	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Protactinium-231	0.000	U	0.791	0.791		2.13	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Radium-226	0.564		0.122	0.136	0.700	0.0448	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Radium-228	0.768		0.196	0.211		0.0612	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Thallium-208	0.257		0.0724	0.0771		0.0294	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Thorium-228	0.769		0.0981	0.140		0.0414	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Thorium-232	0.768		0.196	0.211		0.0612	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Thorium-234	0.754		0.491	0.498		0.398	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Uranium-235	0.000	U	0.203	0.203		0.438	pCi/g	10/03/18 12:58	10/25/18 14:32	1
Uranium-238	0.754		0.491	0.498		0.398	pCi/g	10/03/18 12:58	10/25/18 14:32	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-393536/14-A
Matrix: Solid
Analysis Batch: 397304

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 393536

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	0.1546		0.0773	0.0781	0.331	0.0517	pCi/g	10/07/18 13:14	10/25/18 07:00	1

Carrier	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Yield	Qualifier				
Sr Carrier	84.2		40 - 110	10/07/18 13:14	10/25/18 07:00	1

Lab Sample ID: LCS 160-393536/1-A
Matrix: Solid
Analysis Batch: 397293

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 393536

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Total Beta Strontium	8.17	8.226		0.666	0.331	0.0650	pCi/g	101	75 - 125

Carrier	LCS LCS		Limits
	%Yield	Qualifier	
Sr Carrier	87.2		40 - 110

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-392879/1-A
Matrix: Solid
Analysis Batch: 397290

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 392879

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.06907		0.119	0.119		0.0408	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Actinium-227	-0.3461	U	0.700	0.701		0.418	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Bismuth-212	-0.03813	U	0.686	0.686		0.560	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Bismuth-214	0.06799	U	0.0555	0.0559		0.156	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Cesium-137	-0.002366	U	0.0705	0.0705	0.0700	0.0578	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Cobalt-60	0.0000	U	0.0135	0.0135	0.200	0.0157	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Lead-210	1.394		1.65	1.66		1.25	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Lead-212	-0.06161	U	0.122	0.122		0.112	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Lead-214	-0.04627	U	0.132	0.132		0.112	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Potassium-40	0.2039	U	0.838	0.838		0.388	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Protactinium-231	0.5567	U	1.59	1.59		1.74	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Radium-226	0.06799	U	0.0555	0.0559	0.700	0.156	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Radium-228	0.06907		0.119	0.119		0.0408	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Thallium-208	0.02587	U	0.0559	0.0559		0.0303	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Thorium-228	-0.06161	U	0.122	0.122		0.112	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Thorium-232	0.06907		0.119	0.119		0.0408	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Thorium-234	0.2842	U	0.637	0.638		0.422	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Uranium-235	-0.05831	U	0.339	0.339		0.374	pCi/g	10/03/18 12:58	10/25/18 10:42	1
Uranium-238	0.2842	U	0.637	0.638		0.422	pCi/g	10/03/18 12:58	10/25/18 10:42	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-392879/2-A
 Matrix: Solid
 Analysis Batch: 397283

Client Sample ID: Lab Control Sample
 Prep Type: Total/NA
 Prep Batch: 392879

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2 σ +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	100.7		10.6		0.571	pCi/g	104	87 - 116
Cesium-137	28.1	27.84		2.98	0.0700	0.103	pCi/g	99	87 - 120
Cobalt-60	12.5	12.44		1.31	0.200	0.0246	pCi/g	99	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Rad

Leach Batch: 392495

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-31046-1	PE2-RSYC9-DC-B-S001	Total/NA	Solid	Dry and Grind	
160-31046-2	PE2-RSYC9-DC-B-S002	Total/NA	Solid	Dry and Grind	
160-31046-3	PE2-RSYC9-DC-B-S003	Total/NA	Solid	Dry and Grind	
160-31046-4	PE2-RSYC9-DC-B-S004	Total/NA	Solid	Dry and Grind	
160-31046-5	PE2-RSYC9-DC-B-S005	Total/NA	Solid	Dry and Grind	
160-31046-6	PE2-RSYC9-DC-B-S006	Total/NA	Solid	Dry and Grind	

Prep Batch: 392879

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-31046-1	PE2-RSYC9-DC-B-S001	Total/NA	Solid	Fill_Geo-21	392495
160-31046-2	PE2-RSYC9-DC-B-S002	Total/NA	Solid	Fill_Geo-21	392495
160-31046-3	PE2-RSYC9-DC-B-S003	Total/NA	Solid	Fill_Geo-21	392495
160-31046-4	PE2-RSYC9-DC-B-S004	Total/NA	Solid	Fill_Geo-21	392495
160-31046-5	PE2-RSYC9-DC-B-S005	Total/NA	Solid	Fill_Geo-21	392495
160-31046-6	PE2-RSYC9-DC-B-S006	Total/NA	Solid	Fill_Geo-21	392495
MB 160-392879/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-392879/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 393536

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-31046-1	PE2-RSYC9-DC-B-S001	Total/NA	Solid	DPS-0	392495
MB 160-393536/14-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-393536/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31046-2

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Sr Carrier (40-110)
160-31046-1	PE2-RSYC9-DC-B-S001	84.8
LCS 160-393536/1-A	Lab Control Sample	87.2
MB 160-393536/14-A	Method Blank	84.2

Tracer/Carrier Legend

Sr Carrier = Sr Carrier

1

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